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The Bonanza Silver Mines of Cobalt, Ontario

The Veins Are Small but Remarkably Rich. The Shipments for the Year 1905 Contained an Average of Nearly 4 per cent. Silver

BY W. SPENCER HUTCHINSON*

The ores of the Cobalt district are remarkable for their cobalt and nickel contents, and for their high proportion of silver. The report of the Ontario Bureau of Mines records the shipments for 1905. They were 2144 tons, with an average assay in silver of 3.90 per cent., equivalent to 1139 oz. per ton; cobalt, 5.5 per cent.; nickel, 3.49 per cent. It is estimated that the output for 1906 was 5000 tons, with an average assay of 1100 oz. of silver per ton. Some of the ore is much richer than this, at least one carload assayed as high as 7000 oz. of silver per ton.

MCKINLEY DARRAGH MINE, LAKE COBALT IN THE FOREGROUND

Discovery and Exploration

The first discoveries were made during the building of the railroad in the summer of 1903, and the first ore was shipped in 1904. The development of the district has been retarded by natural conditions. It is a rocky glaciated country, and although there is little soil the surface is covered with timber, moss and glacial drift. The first discoveries were made in rocky cliffs, where little clearing or excavating was required. Other exploring has necessitated much work, and while deposits of glacial drift are not extensive and are usually shallow, a great amount of trenching has been necessary. On the Nipissing property, several acres were washed off last summer by hydraulic piping with water pumped from the adjoining lake. Work of this sort is suspended during the winter. Snow falls early, and the winter is long and cold. This does not interfere with the operation of the mines, which are prepared for it, but all prospecting is stopped.

Discoveries of rich silver ores are so far confined to a limited area, and although the country was overrun with prospectors during the summer of 1906, few discoveries were made which add to the known extent of the rich area. It is remarkable to note that there are veins which seem to be identical in appearance, containing the same heavy cobalt and nickel minerals, which are almost barren of silver. Thus ore shipped by the Nipissing mine from the Old Cobalt vein, assayed less than 5 oz. per ton in silver. Within the limits of the rich area, however, probably 90 per cent. of the veins so far discovered have been rich in silver, while outside that area, although explorations have extended many miles, and similar cobalt-bearing veins have been found, at least 90 per cent. of the discoveries show low silver averages.

Character of Veins

The veins are small, from a knife-blade crevice to a width of 2 ft. The gangue rock is calcite, which is often small in amount in the rich veins, where the filling is chiefly, smaltite or niccolite. The silver is mostly native, but argentite, dyscrasite and some other silver minerals are also found. The common base metal sulphides, pyrite, chalcopyrite, blende and galena, are rarely found or are altogether wanting; the absence of pyrites is particularly notable.

The veins occur in the Keewatin greenstones, in diabase, and in the Huronian formation. It is in the latter that many of the rich silver veins have been found. The Huronian formation is chiefly a conglomerate or agglomerate, containing pebbles and boulders of moderate size, distributed pretty evenly. It is a very hard compact rock, which breaks irrespective of the original structure, and no instance was noted where fresh breaks follow the surface of pebbles or boulders. This rock has a well developed joint structure, exposed most completely in the railroad rock cuts. It consists of two crossing systems of joints, both dipping steeply. These joints have characteristic curved or warped surfaces. The rock is

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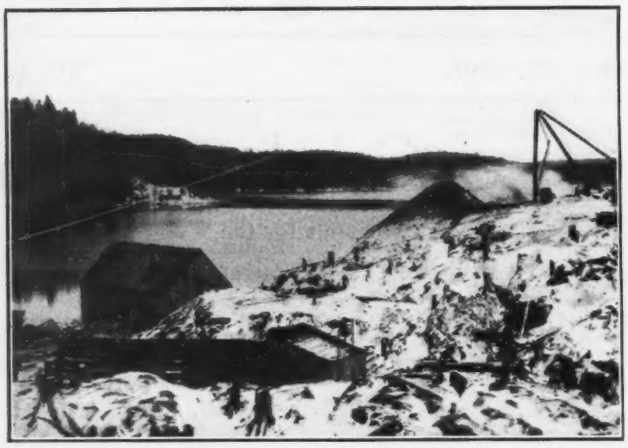

UNIVERSITY MINE, GIROUX LAKE

VEIN NO 19, NIPISSING MINE

altered on the joints with the formation of a thin scale of dark green mineral probably of the chlorite group.

It would be interesting and important if we could arrive at definite conclusions in regard to the probable distribution of the silver in depth, particularly as it is affected by secondary enrichment. Without doubt weathering and leaching of the veins have been of very limited effect since the period of glaciation. At a number of places veins have been exposed on the rounded glaciated rock surfaces where the minerals seem to be no more affected by weathering than the hard conglomerate itself, in which the veins show as a shining metallic streak. Such exposures can still be seen on the Lawson and La Rose claims.

Alteration of Minerals

In other places the calcite is leached out of the vein to a depth of several feet and stains of cobalt bloom appear on the vein walls and in the adjoining crevices of the country rock. There are striking exceptions to these conditions, notably in the Nipissing property in vein No. 8 and in the southwest end of No. 49, where oxidization of the vein minerals is considerable, and cobalt bloom occurs in large amount. The bonanza ore in vein No. 49 shows leached cobalt minerals with argentite scattered through it which has every appearance of secondary origin. That this has formed subsequent to the glacial period seems improbable, in view of the limited alteration at other points, as already described. This suggests the possibility that the rich orebodies now under development at various points at the surface, and at moderate depth, may be a part of a zone of secondary enrichment resulting from weathering and metamorphism related to the surface which existed prior to the glacial period. If so, the corresponding zone of weathering has been completely removed at most points, but its lower parts are still remaining at a few points where it extended lower, or where the glaciers cut less deep.

Character of Veins

The Huronian conglomerate is a rock such as the prospector describes as "tight" or "hungry," and would generally be considered "an unfavorable formation." Doubtless the district was thus regarded by some of the earlier visitors. Development has, however, demonstrated that some of the veins fill fissures with well defined free walls with slickensides and other features generally believed to accompany fissure veins. These veins rarely follow a straight course for any dstance, but curve erratically, sometimes following the joint structure of the country rock, with a resulting wavy effect in the vein.

Smaller and less important veins are found filling some of the joints of the conglomerate. These are usually small, but filled with vein matter, sometimes a sheet of native silver. Some of these seem to be branches of neighboring veins, but the actual connection is not always evident. In some cases the wall rocks are mineralized and native silver is found in the cracks and joints for a distance varying from a few inches up to three or four feet, in such amount that the whole is shipped.

Thomas F. Cole, president of the Oliver Iron Company, estimates that at least $25,000,000 have been spent in diamond drilling for iron ore on the Minnesota ranges.

VEIN NO. 27, NIPISSING MINE

CONIAGAS MINE

NIPISSING ORE IN SACKS AND BARRELS

NIPISSING MINE, VEIN NO. 27

Petroleum and Natural Gas in Ontario

The production of petroleum and natural gas in Ontario, and the conditions and recent development of the fields, are the subjects of a paper by Eugene Coste in the report of the Ontario Bureau of Mines, just issued. The production of both oil and gas showed a marked increase in 1906, recent fields becoming considerably enlarged and more productive. In the case of oil the Leamington field of Essex county, and the Moore field of Lambton county, account for most of the increase, while the gain in natural-gas production is due to the opening of new pools in Welland and Haldimand counties, from which several cities are now supplied. From the figures supplied by a number of logs of deep wells, which are given, Mr. Coste draws the conclusion that, from Osprey township, in Grey county, to Petrolia, in Lambton county, the strata dip more or less uniformly in a southwesterly direction; but continuing further in the same direction, they again rise more or less gradually. It is therefore demonstrated that the Lambton county oilfields are really in the bottom of a broad deep syncline, instead of being on the Cincinnati anticline, as is often contended. New records of the wells in the Niagara peninsula adduced, as well as others previously published, show that the strata of that peninsula have a more or less constant dip to the south-southeast. As the gasfields of Welland and Haldimand counties are on the flank of that long slope which continues to the south across Lake Erie into New York and Pennsylvania and also to the north across Lake Ontario, it is to be seen that the famous anticlinal theory of oil and gas production is far from being supported by the facts either in the gasfield of the Niagara peninsula or in the oilfields of Lambton county. Disturbances and faults exist in these fields, sometimes bringing up the strata locally in blocks, terraces or sharp folds, but the more or less broad anticlines which the supporters of the theory of the organic origin of oil and gas regard as necessary to the large accumulation of those products are conspicuously absent.

Another result of the drilling recorded in the logs is that both oil and gas have been found in the lower part of the Trenton and right on the top of the Archean formation, which cannot be explained by any other view of the origin of oil and gas than that of volcanic emanations from below, as held by the French school of geology. The practical bearing of this conclusion upon the oil and gas industry is important. In planning future developments in Ontario it is of consequence to know that oil and gas may be looked for in large quantities just as well under the Petrolia oil rock—the Corniferous limestone—as in or above it; and therefore drilling along the fissured oil-belts which traverse Ontario, in exactly the same manner as they traverse Pennsylvania, Ohio and Indiana, will develop similar fields of oil and gas. In support of his conclusion Mr. Coste adduces the facts that in the Leamington oilfield the oil comes from the Guelph limestone, a stratum 1500 ft. below the Corniferous, and that the gasfields of Welland and Haldimand derive their supplies from the Clinton, Medina and Trenton, which are still lower strata.

VEIN NO. 27, NIPISSING MINE

OPEN CUT, TRETHEWEY MINE

Economy of Gas Power Plants for Collieries

Electric Distribution of Power from a Central Gas-engine Installation Using Waste Gases and Culm Offers Many Advantages

BY FRANZ ERICH JUNGE*

The remarkable and unprecedented development of economic methods of power generation which has been inaugurated in Germany within the last ten years has benefited the iron industry of that country in a measure superior to that exercised on any other branch of production. It has rendered the relation of power production to power consumption, through the preclusion of additional expenditures for costly boiler coal, more economical, and through the judicious utilization of the available gases and other waste within and outside the works, greatly more profitable.

The simple consideration that a saving of only 1 per cent. in self cost of production may amount to an increase of 10 per cent. and more in net profits secured from the sale of the finished goods has been confirmed time and again in the German iron industry. The economic husbanding of available gases has reduced the price per ton of pig iron smelted by from 50c. to $1.25, according to the use or salability of the surplus power, and the price per ton of finished goods turned out by from $3 to $4, according to locality. These figures prove better than can any technical argumentation that the economies to be derived from the application of gas power in the iron industry cannot, indeed, be set aside as a negligible quantity.

Value of Furnace Gases

To point out that the difference in quality of effluent gases from European and American furnaces, which is due to a material difference in temperature of blast, ore analysis, speed of driving, etc., is sufficient to warrant any hesitation, on the part of American iron masters, to follow the example set by the Germans and to utilize these gases directly in gas engines instead of under boilers and in steam engines, means to completely misunderstand the action of the blast furnace as a producer of gas. At the same time it means to underestimate the efficacy of, or the effect which the cleaning process exercises on those characteristics of blast-furnace gas that make it an ideal means for directly converting the kinetic coke energy into either blowing work or electrical power.

Even the extraordinarily poor gases which emanate from the furnaces of copper smelting plants, the calorific value of which does not exceed 400 calories per cu.m., or 45 B.t.u. per cu.ft., are now utilized for the generation of power, the most notable plant of this kind being that of the Mansfeld Copper Company, of Eisleben, Germany, where the available furnace gases are used in Koerting gas engines.

Gas Power in Coal-mining Pursuits

While the paramount importance which these achievements possess in the field of industrial economics is gradually being realized by the metallurgical engineers of all progressive countries, the effect of the application of gas power on the economics of coal-mining pursuits is apparently not yet so well understood and appreciated. It is the object of this study to analyze the possibilities and limitations which confront us when attempting to abandon, in the coal and coke-making industries, the traditional modes of steam-power generation in favor of what is deemed, under certain conditions, the most efficient method of production so far devised, namely, gas-engine driven central station and electric drive all over the works. Conditions differ materially from those which obtain in iron and steel smelting plants in that the factor of power demand within the plant (coal mine and coke-oven works combined) is much less predominant unless such obstacles as excessive depth of shaft, or abundant water influx require an abnormal amount of power for hoisting and pumping. Yet even when the power factor is only a small item in the total operating expenses it must be remembered that every cent saved through economic power generation and transmission in the production of one ton of coal will yield tenfold and more in net profits returned from its sale. The judicious selection of the most economical system to be adopted is, undoubtedly, a complexer problem in colliery work, and especially in such as form side branches of existing plants, than it is elsewhere, on account of the great variety of power sources that are available.

In collieries having coke ovens attached to the mines, which are to transform a certain percentage, usually one-fourth to one-third in European practice, of the annual coal output into coke, there are the following sources of energy which can be used for the generation of power:*

(1) Waste Heat from Non-by-product Retort Coke Ovens

The burnt coke-oven gases when leaving the flues have a temperature of some 1100 deg. C. (2000 deg. F.) which may be used for steam raising. Assuming that an average of 10 kg. (22 lb.) of steam are required per kw. hour, then 10 kg. of coal (22 lb.) charged into the coke oven will give 1 kw. hour.

It can be taken that, approximately, one-sixth of the value of the coal is thus regained through the sensible heat of the gases which are generated and burnt in this type of oven. The best figure so far recorded is an evaporation of 1.4 kg. (3 lb.) of water per 1 kg. of wet coal charged in the retort. This type of coke oven is now being superseded by ovens of superior construction.

(2) Coke-oven Gas for Use under Boilers or in Gas Engines

When burnt under steam boilers in connection with reciprocating-piston steam engines or turbines, an average of 3 cu.m. (106 cu.ft.) of gas (having a heat value of from 2700 to 5750 calories, 300 to 650 B.t.u. per cu.ft.) will be required per kw. hour. When used in gas engines one-third of this amount, viz., 1 cu.m. (35.3 cu.ft.) is consumed per kw. hour. The best result so far attained in Germany is 1 brake horse-power, requiring 2000 calories (7800 B.t.u.), corresponding to 12 cu.ft. of 640 B.t.u. coke-oven gas.

The quantity of surplus gas available per ton of coal, that is, the amount not used for heating the retorts, depends on the grade of coal, on the moisture contents, and on the type of oven. With the non-regeneration by-product type the average is 60 to 70 cu.m. per ton (212 to 247 cu.ft.). On account of the elimination of the by-products in the recovery plant the total power developed by the sensible heat of the burnt gases leaving the oven and the inherent heat of the surplus gases is usually less than what is obtained under 1, namely, 0.9 kg. (2 lb.) of water evaporated per kg. of coal. Of this amount two-thirds is due, approximately, to the sensible heat of burnt gases and one-third to the inherent heat of the surplus gases. It is difficult to define this ratio exactly.

With the latest regeneration type of by-product oven only the inherent heat energy of the surplus gases is utilized, but their quantity is larger, 140 cm. (4942 cu. ft.) are recorded in Europe, while with the rich American coals up to 5500 cu.ft have been attained in United Otto ovens.

(3) Waste Steam

Through the application of condensing engines this item has recently been much

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*The data advanced in the following are based on European and principally on German conditions.

reduced. Especially engines which do continuous service, such as compressors and fans for mine ventilation, can thereby be operated more economically, while with the hoisting engines and others that operate intermittently the saving in steam is less pronounced.

The recent combination of hoisting engines with Rateau steam accumulators or regenerators and low-pressure or exhaust-steam turbines coupled with electric generators gives additional power without added heat cost, the gain being approximately 1 kw. hour from 20 kg. (44 lb.) of waste steam. It is known that steam hoisting engines, with their extremely fluctuating demand for steam, are very wasteful in consumption. The average results show from 50 to 60 kg. (110 to 132 lb.) of steam per shaft horse-power per hour and more. But as low as 29 kg. (64 lb.) have been recorded on German mines, the engines being of modern type and working with an improved admission-governing device.

It has also been found that for hoisting engines, working with full admission and short expansion, condensing does not pay, whereas with engines having an ample range of expansion the connection with a central condensing plant is an advantage. The addition of waste-steam turbines and Rateau accumulators will increase the economic efficiency of the first named type of engines more than it will the latter. In some cases the increased capital outlay will annul the gain in steam economy entirely.

The question is again strictly one of local conditions. By far the best plan for a new steam plant to be erected would obviously be to eliminate central condensation entirely and to install low-pressure steam turbines instead. This is a feasible proposition, provided that the turbines can fully utilize the available steam, and that there is a field for the surplus energy thus gained either within the colliery or outside. We shall enlarge upon this subject further on.

(4) Inferior Grades of Coal and Mine Culm

The relatively better grades can either be burnt under boilers for steam raising or be directly gasified in producers. The generation of steam power requires, with coal-fired boilers, in the neighborhood of 1.5 kg. (3.3 lb.) of coal of 6000 calories per kg. (10,800 B.t.u. per lb.) per kw. per hour. With gas-fired boilers, the gas being made in producers, the same amount and more and often less is used, depending on the character of the particular coal used.

The generation of gas power in gas producers and gas engines requires only 0.75 kg. (1.6 lb.) per kw. per hour, and usually less.

Mine culm is now in almost all collieries stored in huge piles, which occupy an enormous space. With limited floor area, as obtains, for example, in narrow valleys or creeks, it is necessary that the culm be removed from time to time. Under especially unfavorable territorial conditions this may require the building of tunnels, railways, etc. Therefore it is obviously a great improvement to dispose of culm banks by direct gasification of the material in producers, gaining, beside an enormous amount of surplus power at no added heat cost, a welcome reduction in weight and volume of waste that has to be handled, thereby reducing the item of labor which must be expended for that purpose correspondingly. In Germany several collieries are equipped with culm producers, which usually serve as an auxiliary or reserve to other sources of gas generation.

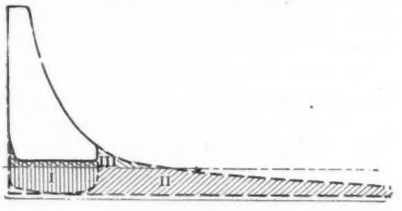


FIG. 1. EFFECT OF ADDING EXHAUST TURBINES

FIG. 2. EFFECT OF ADDING EXHAUST TURBINES

(5) Electric Current

Collieries having no coke-oven plant connected with the mines may use, for producing motive power, electric current from neighboring or distant central stations. This most modern, convenient and economical form of application eliminates the special power-house with its prime movers, generator equipment and reserves, each mine having but a transformer substation from which the various motors for hoisting, pumping, ventilation, etc., are driven.

Old established mines have, of course, all their individual power plants, most of them being laid out as steam-driven electric stations with scattered steam drive of the larger machines. So, electric distribution is only possible when branching out or when opening up new coal-fields. Usually the mine which has the best coal for coking purposes will have a central station equipped with gas-engine driven alternators, the potential of which is to depend on the dimensions of the coal-fields or on the radius of the particular distribution sphere available. The other shafts or places of usage receive their required electric current, according to their respective momentary demands, without having to pay the capital and depreciation charges for special power plants, at the same time having the guarantee of continuous supply and ample reserve.

For equalizing load fluctuations such as occur especially in hoisting service, Siemens-Ilgner fly-wheel sets, which employ the inertia, or, better, the power-accumulating capacity of very heavy fly-wheels, have given great satisfaction in German practice.

(6) Other Fuels

When coal oil or its derivatives are available at low cost a very economical source of power generation is offered by the direct combustion of these fuels in Diesel oil engines.

The use, in colliery work, of oil and natural gas transmitted from a distance may seem paradoxical at first sight. But the question is entirely one of local conditions and load factor. The possibility offered by the application of gas or oil power, of immediate starting, the absence of steam boilers and pipings with their condensation losses, the reduction and practical elimination of stand-by losses, and other factors besides, are to be considered.

No general formula can be laid down, and each problem must be treated separately. Soundness of judgment is the only rule to guide one. Compressed gas and oil fuels may be used either for driving the prime movers in the central station, and having pure electric drive all over the works, or for operating the scattered engines at their respective places of usage. The greater possibility of breakdown, the higher class of attendance required, and the inabilty to carry heavy overloads are some of the drawbacks militating against the latter application and favoring centralization.

Altogether, the combinations designated under 6 are more of a speculative than of a practical nature. Yet they may occur and should therefore be considered in a discussion of this character.

Amount of Power Available

Just how much of the power derived from one or more of the above named sources of energy will be consumed within the plant is entirely a matter of local conditions. None of the data advanced on this subject can be generalized. At best they may serve to give an approximation

to the truth. The amount of surplus power available for outside purposes depends on the moisture and quality of the coal coked, ond the quantity of the coke output, on the type of oven and on the demand for power for operating the machinery within the works.

As an average example of German practice can be taken a colliery in the Ruhr district having an annual coal output of 600,000 tons, of which one-fourth is coked. From waste heat and waste gases a continuous capacity of 3000 h.p. is obtained, of which as much as 2500 h.p., or 83 per cent., and sometimes more, are consumed within the works.

Dr. Hoffman, of Bochum, in commenting on this new system in a paper read before the Verein Deutscher Ingenieure at Berlin, gives the following figures on the performances of compound engines versus such exhausting into low-pressure turbines: With 1.2 atmospheres (17.6 lb. per sq.in.) admission pressure and 90 per cent. vacuum, low pressure cylinders of several hundred horse-power capacity consume approximately 24 kg. (53 lb.) of steam per kw. hour. Low-pressure turbines of over 1000-h.p. capacity, on the other hand, working under the same conditions, give a guaranteed consumption of 18 kg. (40 lb.) of steam per kw. hour.

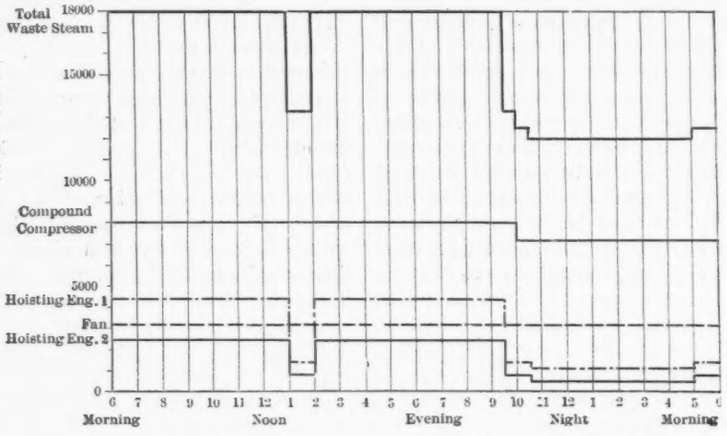


FIG. 3. RELATION OF WASTE STEAM TO POWER REQUIREMENT

It is seen that low-pressure steam turbines can improve considerably on the low efficiency of bad engines, but they can never make good engines out of them. Figs. 3 and 4 show the relation of waste steam available to electric energy required in the Alma mine, which is a branch of the Gelsenkirchener Bergwerks Gesellschaft, having an annual coal output of 600,000 tons.

Since the exclusive adoption of gas power, which means having coke-oven gas engines in the central station, gas producers as a reserve, and employing electric drive for all machinery throughout the plant, eliminates the use of steam boilers entirely, the above reference to the position which the low-pressure and waste-steam turbines occupy at this date in the steam-power problem of collieries will be all that is necessary to say on the subject.

Distribution of Power within the Plant

Before discussing the merits of electric centralization and pointing out the relative advantages and drawbacks of the three principal types of prime movers, piston steam engines, turbines, and gas engines, which may be employed in the power-house of a combined coal mine and coke-oven plant, it may be well to analyze the distribution of uses to which the power derived from the various sources

The growing introduction of the regeneration type of Otto by-product ovens tends to increase the amount of surplus power available for outside distribution or sale. The largest German colliery, "Rheinpreussen," will shortly have an annual output of 3,000,000 tons, of which one-third is coked. A very conservative estimate shows that 17,000 h.p. can be generated continuously from the coke-oven gases in gas engines. Owing to the small depth of shafts and little water influx, only 58 per cent., viz., 10,000 h.p., will be consumed within the works, the rest being available for outside uses.

The item of surplus power is, with the rich American coals, when coked in the latest type of United Otto by product oven, even much greater and gas power seems therefore the only legitimate mode of generation prescribed.

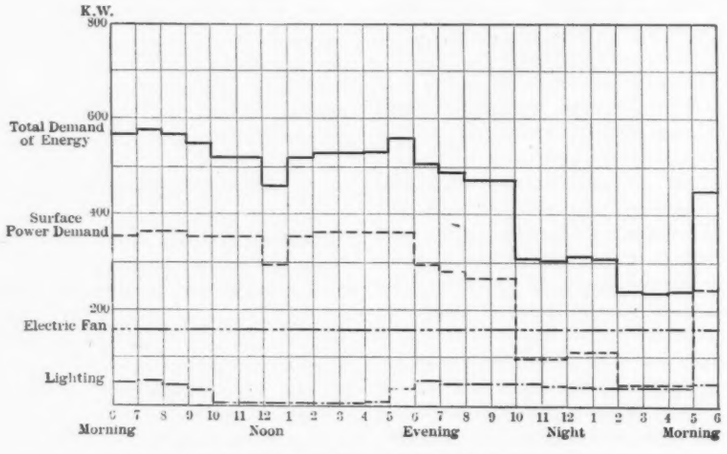


FIG. 4. POWER REQUIREMENT CORRESPONDING TO FIG. 3

Low-pressure or Exhaust-steam Turbines

In order to be able to intelligently discuss the prospects of gas-power application in colliery work, it is necessary to get quite clear as to the possibilities and limitations which confront us in the application of central or direct steam drive, especially since the low efficiency of old-fashioned engines has been greatly improved by the introduction as well of modern condensing steam engines as of the low-pressure exhaust or waste-steam turbines.

Not included are losses due to condensation in the pipings.

Up to the middle of 1906 ten plants of the low-pressure turbine type, aggregating an output of 8000 h.p., had been installed in German collieries. The accompanying Figs. 1 and 2 show the improvements that may be effected from the application of low-pressure turbines, with good and with bad engines respectively. Area *I* represents the gain that can be made by condensing, area *II* is the surplus gain effected through the turbines, and area *III* represents the loss which is unavoidable, notwithstanding the new improvement.

can most advantageously be put within the domain of the works.

Since it has been recognized that a judicious administration must aim toward the utilization of all available waste or low-grade fuel that is produced within the plant before having recourse to costly boiler coal for generating power, the most natural way, in works that coke a sufficient quantity of rich coal, is undoubtedly to use the available coke-oven gases either under boilers or directly in gas engines. The power thus liberated should preferably be consumed at once in the different departments of application: hoisting, pumping, compressing, washing,

etc., in the same measure as it is produced.

Variable Demand

Since the production of gas in the coke ovens and therefore the generation of power is a continuous process, a combination of this character would only be feasible if we had an ideal plant-load factor, viz., if the utilization coefficient was 1. Unfortunately this is not the case as can readily be seen from Fig. 4. Few of the engines are in continuous operation during the 24 hours of a daily run or during the 32 or 36 hours, which constitute the coking period of modern ovens. Among these are the prime movers in the electric central station and the fans for mine ventilation. Sometimes, depending on local conditions, drainage pumps and compressors must also do continuous service.

So it is natural that one will try to connect these continuous users to the continuous sources of power, viz., to the coke-oven gas driven part of the power plant, while such intermittent working machinery as the large hoisting engines will be connected to the other part of the power station, which derives the dynamic medium from either gas producers and engines, or gas-fired boilers and engines.

Though it is possible to store surplus coke-oven gas during periods of low demand in holders, or to accumulate it in form of electrical energy in storage batteries, it is obvious that these provisions mean an increased capital outlay and fixed charges for additional apparatus and ground area, an item which is considerable when the storage capacity shall be large enough to be of real value as a reserve; when employing producers fired with culm or other waste or even coal-fired boilers, then the consumption of power and the expenditures for fuel can be more nearly balanced.

The modern coke oven, owing to its capability of subdivision and reliability, is an ideal apparatus or source for the continuous generation of gas, and needs practically no reserves in contradistinction to the blast furnace, when either a coefficient of safety must be introduced in the disposal of the gas, or else a bank of gas producers should be available as a reserve. This leads us to the discussion of another question of vital interest, viz.:

Gas Producer versus Steam Boiler

The effect or importance which the load factor and the initial cost of equipment possess in the columns of steam power-plant economics is generally known. It is now also a matter of universal concession that gas producers and engines are greatly more adapted for intermittent working than are steam boilers and engines. The amount of fuel required to keep the gas producer in such a state that it can be put into full work at a few minutes' notice is a mere fraction of the amount required to keep steam boilers with their fires banked.

Where sudden increases in load may occur at any time and full steam pressure must be kept up, the stand-by fuel losses amount, even in the best regulated boiler plants, to 30 per cent. and more of the full load-running fuel, while certain types of producers will stand with air-admission doors almost closed, for one and more days in a condition of preparedness for instant operation, requiring but a few buckets of coal to replenish the fuel bed, and a motor-driven fan which will quicken the fire to full heat within a few minutes after giving the starting signal.

For this reason producers are admirably adapted to serve either as the principal source of gas generation or as a reserve; for example, in blast-furnace work and in the natural-gas region. Their economy of operation is due notably to the fact that such low grades of coal as "culm" may be used as fuel, which cannot at all be utilized under boilers; also to the peculiarity mentioned that they will retain their high efficiency on low outputs; and, finally, to their ample overload capacity combined with the desirable feature that, when properly subdivided into separate units or retorts, and embodying means separate from the engine to automatically vary their output according to the momentary demand, they will stand all the strain exercised upon them by a very fluctuating plant load.

All these advantages of superior economy and simpler operation are now so well known that together with the low initial cost and upkeep, absence of danger from explosion, elimination of smoke nuisance, etc., they are bound to impress themselves favorably on the mind and purse of the intelligent user of power. The ultimate adoption of the suction type of producer has also eliminated the bulky, inefficient and costly gas holder, at the same time obviating the use of special coal-fired boilers for producing the steam that is required in the gas-generating process, and which is now gained from the waste heat of the producer gas. The employment of electrically driven fans, which are automatically regulated from the central station according to the load, for doing the suction work instead of steam ejectors ,has made the engine practically independent of the gasification process, and has increased its capacity in a ratio corresponding to the difference of admission pressures of the dynamic media at the intake.

Electric Centralization

In the majority of cases the power system in combined coal mines and coke-oven plants consists of a central boiler plant which supplies steam to a small electric lighting and power station and to the various large and small engines which are scattered over the plant and serve to drive the respective winding, pumping, compressing, etc., machinery directly. We shall refer to this form of application as direct steam drive. When gas power became a claimant for recognition in this field and when it was found desirable to generate all the required power from the available gas or waste without added heat cost, the conversion of energy in gas prime movers and the distribution of these engines along the different places of usage seemed the more desirable.

Provided that modern regenerative by-product ovens constitute the coking plant, this system of direct gas drive has even now many points to commend it. In the meantime, however, the situation has assumed a greatly different aspect since, through the rapid development of the electrical industry, and that of the steam turbine and large gas engine, the generation and transmission of electric current, at least within moderate ranges, has become so reliable and economical that we are getting more and more inclined to adopt either one of the two methods: steam-turbine driven central station or gas-engine driven central station and electric drive all over the works.

Red Hematite for Metallic Paint

Hematite suitable for making red paint occurs in certain localities in northwest Georgia and southeast Tennessee, according to E. F. Burchard, of the U. S. Geological Survey, in the forthcoming volume "Contributions to Economic Geology, 1906."

In these localities the Clinton, oolitic, hematite ore occurs in beds too thin to be profitably mined as iron ore under present conditions. As it contains an unusually high percentage of ferric oxide with but little silica and alumina and practically no lime, it is suitable for red and brown paints.

The deposits are too limited and too thin to warrant the expensive equipment necessary for iron mining but the ore is sufficiently valuable as a paint material to bear the cost of mining by hand and hauling in wagons to the railroad.

The ore is ground by paint mills at Chattanooga, a part going to Birmingham firms. The paints made are the reds and dark browns, and a considerable quantity of the ground oxide is sold for coloring sand, lime bricks, and mortars for pressed brick work.

The paint-ore beds at Wildwood and at Estelle, Ga., are near Lookout mountain, the formation consists of about 600 feet of calcareous and sandy shale with some beds of blue limestone, sandstone, and fossiliferous hematite.

The red paint ore produced in Tennessee comes mainly from White Oak mountain and a smaller ridge lying to the east of it. The mines are all within four miles of Ooltewah.

The Elmore Vacuum Flotation Process

By Edward Walker

The British patent 17,816, of 1904, granted to F. E. Elmore, of London, describes a modification of the Delprat and Potter processes for floating metallic sulphides by immersing them in acid solution and so separating them from the gangue. The modification consists in carrying on the process under a vacuum. By this means far more bubbles of gas are generated per pound of acid used, that is to say, the gas given off expands greatly in the partial vacuum formed.

The following is the specification:

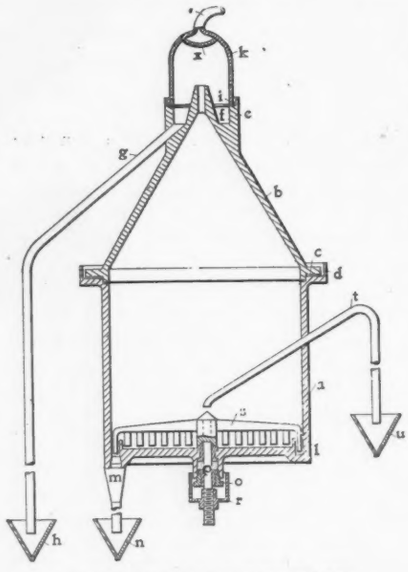
"Processes of separation have been devised which depend upon the circumstances that under certain conditions some of the particles of a finely divided mixture rise or float in a liquid while others sink therein. Among artificial conditions for bringing about such a separation is mixing a pulp of the finely divided material with an immiscible liquid such as tar or oil, with soap or the like, or with an alkali, an acid, air or a gas, or with any of the aforesaid substances in conjunction with each other.

"By the present invention all such processes are improved, more particularly in the respect that a smaller proportion of the added substance, such as oil or acid, may be used, by conducting them wholly or in part under a reduced pressure. For instance, a vacuum or partial vacuum may be maintained in the separating vessel or chamber. The accompanying drawing illustrates in vertical section a suitable form of apparatus; *a* is a vat (constructed of a suitable material to withstand any chemical action of the contained liquid) whose conical cover *b* rests on a washer *c* supported by the flange *d* on the vat. The summit of the cone is perforated and has a flange *e* which forms a circular channel *f* around the summit wherefrom is an escape pipe *g* dipping at its lower end into the vat *h*. A shoulder on the flange *e* receives a washer *i* on which rests a bell *k* preferably of glass.

"At the bottom of the vat *a* is a circumferential channel *l* having an escape pipe *m* the lower end of which dips into a vat *n*. Through a stuffing box *o* at the center of the bottom passes a shaft *p* carrying a pulley *r* and a rake of suitable material *s* which is revolved by the pulley in any suitable manner. The teeth of this rake extend to within a short distance of the bottom of the vat, with the exception of the two end teeth which extend to within a short distance of the bottom of the circumferential channel *l*.

"The pipe *t* the lower end of which dips into a vat *u* delivers pulp above the rake at a greater rate than the escape pipe *m* can carry it away so that a part of the liquid escapes through the summit of the cone into the channel *f* and away by the pipe *g*. The cover *k* is fitted with a baffle plate *x* to prevent splashes being carried into the pipe *v* which is connected to an exhauster or air pump. If the vats *h* and *n* be filled with water and the vat *u* be filled with the pulp to be treated together with the separating medium and a suction be applied through pipe *v* the vat *a* will be filled from vat *u* the relative hights of the vats *h n u* and *a* having been properly adjusted to secure this. The pipes *g m* and *t* may be fitted with cocks or valves for regulating the flow or the lengths of the respective pipes may be made adjustable. By means of the air pump or exhauster a suitable minus pressure is maintained in the vat *a* and a continuous passage through vat *a* of material to be treated is secured by proper regulation.

"As the particles to be separated pass through vat *a* some of them settle on the bottom and are transferred by rake *s* to



ELMORE VACUUM CONCENTRATOR

trough *l* and thence by pipe *m* to vat *n*. Other of the particles ascend in vat *a* and pass away with more or less of the liquid through the perforation in the summit of the conical cover *b* thence to the channel *f* and by pipe *g* to vat *h*."

The specification, though not very clear, points to the fact that, by means of the suction of the air pump and the arrangement of the feed pipe and two discharge pipes, the process can be made continuous and automatic. If we take the patent as applied to the Potter & Delprat processes, the amount of acid or acid sulphate used for generating gas by its action on the carbonate of zinc or calcareous matter in the ore will be decreased inversely in proportion to the amount of vacuum used. This should lead to economy of materials used, and should reduce the many disadvantages arising from the use of strong solutions.

The vacuum would also make use of air and gas ordinarily in solution in water, and probably water vapor would also be given off. By aid of these other sources of bubbles, the amount of acid used would be reduced still further.

A report from the manufacturers of the machine gives the results of the first 5-ft. diameter vacuum concentrator in operation, treating low-grade copper ore from an old mine dump in Cornwall. The ore treated assayed 0.54 per cent. Cu; the tailings produced contained 0.11 per cent. Cu, and the concentrates, 9 per cent. Cu.

The capacity of the machine, so far as ascertained, seems to be about 35 to 40 tons of crude ore per 24 hours. The crushing mill used in the test consists of a stone breaker and 10 head of 1000-lb. Californian stamps. The speed is 160 drops per minute, and the screens are of 20 mesh. The battery pulp passes directly from the stamps through a thickening tank to the mixer and is not subjected to any sizing or other preliminary treatment.

Judging by the very low tailings values, it seems probable that the machine would give good results, even with a more liberal feed.

The percentage of concentrates recovered does not seem to influence the working of the machine. A test with zinkiferous tailings from Broken Hill, which has very heavy gangue of garnets and rhodonite and assays 17 per cent. zinc (as blende) yielded about 40 per cent. of the concentrates, and the machine appeared to have as high a capacity as on the low-grade copper ore.

Gypsum in California

There are four gypsum mills in California, according to F. L. Hess, of the U. S. Geological Survey. One is at Amboy, one at Los Angeles, and two at Palmdale. Of those at Palmdale one is still in process of construction.

The product of these mills is consumed in the State and is used mostly for wall plaster, a smaller amount being ground for fertilizer. Usually gypsum runs from 54 to 90 per cent. pure, but deposits occur in the form of alabaster which are very pure and are suitable for the manufacture of plaster of paris; they are far from railroads and so at present are unavailable.

The deposit at Amboy is found in the middle of the Mojave desert, along the tracks of the Santa Fe Railroad. The plant is situated near the bed of an old lake, around the edge of which the gypsum has been deposited.

Plaster usually sets in about 5 minutes and because of this a retarder, often consisting of slaughter-house refuse, dried and powdered, is used, which delays the setting from 50 minutes to 2 hours. There is nothing peculiar about the California gypsum as distinguished from that of other localities. Oil is used as fuel in the gypsum mills of California.

Electrolysis of Gold from Cyanide Solutions

At Reliance Mill, Nelson, B. C., a Solution Temperature of 70 deg. F. Was Employed and High Alkalinity. Precipitation Was Complete

BY DOUGLAS LAY*

The method of recovering gold and silver from cyanide solutions, by precipitation on filiform zinc, has for many years held its own, and is the method still in vogue at the great majority of cyanide plants. Electrical precipitation, introduced by Siemens & Halske, though not of such wide application, undoubtedly possesses advantages over zinc precipitation, when the cyanide solutions are very weak, or when they contain an undue proportion of base metals. Briefly, the process consists in the electrolysis of cyanide solutions, by the suitable disposition of electrodes within the solution, whereby the precious metals are deposited upon the cathodes, or negative electrodes, which are usually of lead.

An account of a method of electrical precipitation at the Reliance mill, near Nelson, B. C., for the design and installation of which I am responsible, may be of interest. The solutions generated during the process of milling amount to 150 tons per 24 hours. Consequently, the precipitation facilities have to cope with that rate of flow. It is essential that the solutions prior to the passage through the electrical precipitation tanks be clear, that is, free as far as possible from matter in suspension. It is not the purpose of this article to describe the means by which settlement of slime is effected in this particular case.

Precipitation Tanks

The precipitation tanks are three in number, each 35 ft. long, 5 ft. wide and 3 ft. deep in the clear, and each contains 3500 sq.ft. of cathode surface. The tanks are placed side by side, the rate of flow of the solution through each tank being 50 tons per 24 hours, or approximately 2 tons per hour. With that rate of flow all the precious metals in the solution are precipitated in one passage through the tanks.

After passing through the precipitation tanks the solution flows into a sump, whence it is elevated by a centrifugal pump to a storage tank ready for another charge of ore. The solutions have an average strength of .01 per cent. KCy.

The anodes are of No. 10 sheet iron 5 ft. 1 in.x2 ft. 8 in. They fit into saw cuts in the sides and bottom of the tank. To promote thorough circulation, alternate anodes are raised 1½ in. above the level of the solution, the remaining anodes being fitted into the bottom of the tank. Each alternate pair of anodes, therefore, forms a water-tight compartment, the flow being *over* one anode, and under the next. The distance between the anodes is 3 in. The anodes are inclosed in cheese-cloth to prevent any chance of short-circuiting from possible contact with the cathodes.

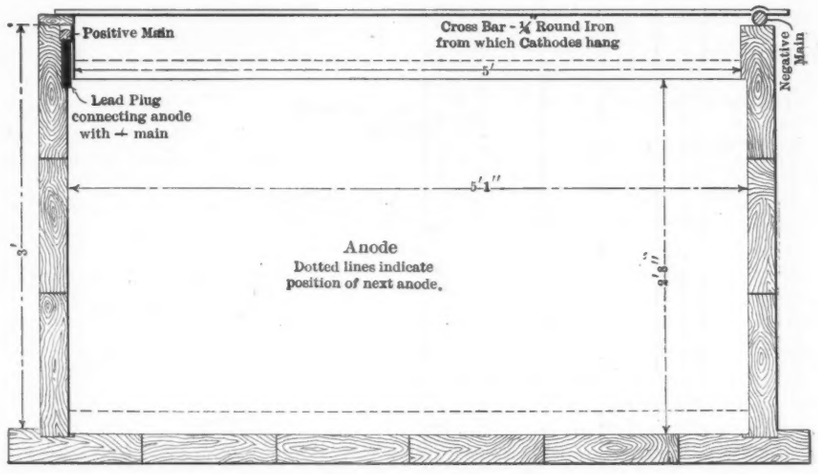
Connections

The electrodes are connected in multiple, the positive main wire running along one side of the tank, and the negative main along the other. The anodes and exposed connections, below the level of the solution are gradually eaten away, if exposed to the action of the current, consequently, these connections must be thoroughly protected. The following simple and efficient manner of connection was devised to this end. The main positive wire, to which each anode is connected, is carried along the top of one side of the tank in a plough-way or groove. The anodes project ½ in. into the sides of the tank, being fitted into saw-cuts. From the bottom of the plough-way in the side of the tank, carrying the positive main, ½ in. holes are drilled to the anodes, and connection established by filling the holes with molten lead, the saw cut above the tops of the anodes being luted with cement. On the side of the tank is tacked a strip of wood ½x3 in., which prevents oxidation of the main wire. On this strip rests one end of each of the cross-bars, which carry the cathodes.

Cathodes

The cathodes are of sheet lead, of approximately the same area as the anodes. They are suspended from cross-bars midway between the anodes. The cross-bars are of ¼ in. round iron, and are supported by the sides of the track, one end resting on the main negative wire. For convenience in handling, each cathode is divided into three portions, each of which weighs about 7 lb. and is suspended from the cross-bar by two strips of roofing tin. The gold and silver are precipitated on the cathodes as a bright coherent metallic deposit.

The cathode sheets are made at the Trail smelter by a patent process, the cost of making them being merely nominal, one man turning out about 500 per shift. They are loaned to the mining company by the smelter, and after immersion in the precipitation tanks for one month, are returned to the smelter, the latter purchasing the gold and silver on a base bullion basis.



CROSS SECTION, PRECIPITATION TANK

Current Required

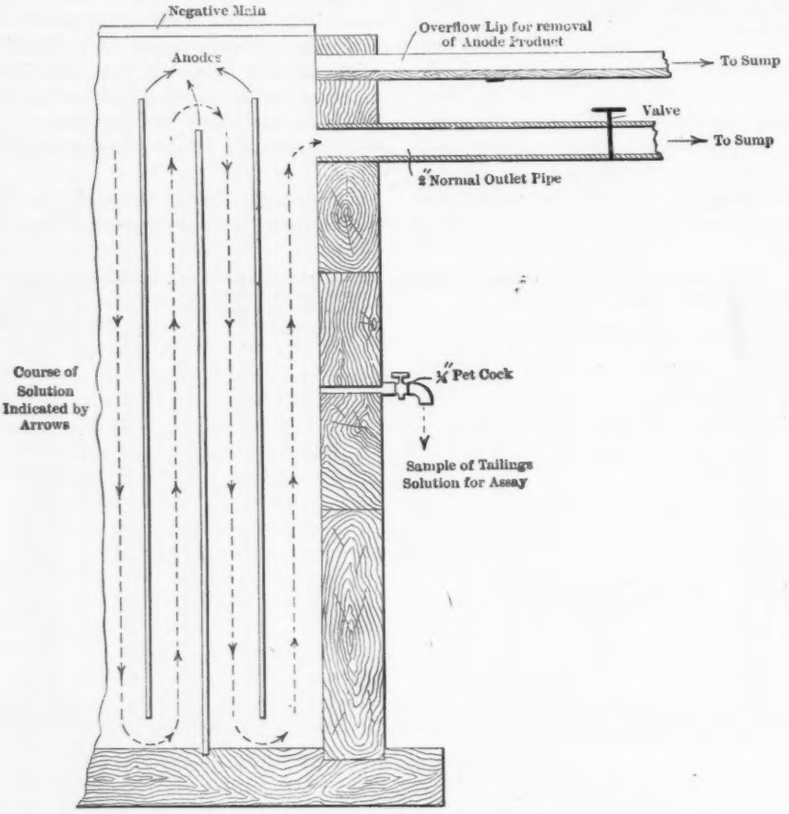
Only a very weak current is needed for precipitation, the pressure being from 4 to 5 volts, and the current density 0.02 to 0.03 ampere per sq.ft. of cathode surface. The anodes are slowly oxidized and eaten away by the action of the current. The anode oxidation product is largely composed of ferric hydrate which rises to the surface of the solution.

The removal of this oxidation product is readily effected by the following means: The normal level of the solution in the

Note—The system here described was in use until the Reliance mill ceased operations, several months ago.

*Metallurgical chemist, Silverton, B. C.

tank is that of the top of the anodes, which extend to the bottom of the tank. Every alternate anode being 1½ in. above this level, the floating anode product is caught by these projecting plates. The normal outlet pipe is fitted with a valve, and is of course placed at the normal level of the solution. Above the level of those anodes which are raised 1½ in. above the normal solution level, the tank has at its outlet end an overflow or outlet lip. By closing the valve on the normal outlet pipe, the level of the solution can be raised above the projecting anodes, and there is then a direct flow throughout the tank carrying away the floating anode product over the outlet lip into the sump tank.



SECTION, OUTLET END OF PRECIPITATION TANK

This operation occupies only 2 or 3 min. and the only labor entailed is that of closing and opening a valve. It is done once a shift.

Efficient sampling of the solutions is effected as follows: At the inlet end of the tank, below the level of the solution is a ¼-in. pet cock, which is opened very slightly so that there is a constant drip into a suitable receptacle. An assay of this sample will give the average value of the solution before precipitation during any given period. A similar device at the point where the solution leaves the tank samples the solution after precipitation.

Precautions to be Observed

The following considerations are of the utmost importance in the successful application of the process:

It must not be expected that the deposition of gold and silver will be in exact accord with the theoretical principles set forth in text-books on the subject of electrolysis. In practice we are dealing with conditions widely different from those contemplated in a text-book exposition of the laws governing electro-deposition.

In practice we have an exceedingly dilute electrolyte containing an extremely small percentage of precious metals to be deposited. Consequently much of the energy of the current is wasted in the decomposition of water. Two factors of the utmost practical importance confine the current within very narrow limits. These factors are, first, the life of the anodes, and, second, the nature of the deposited metal. The wear of the anodes is the only serious item in the cost of the process. That wear is directly dependent upon the current density employed. The greater the current density, the faster the wear, and consequently the greater the cost of the process. To attempt a rapid deposition of gold by the employment of a high-current density is quite out of the question.

In regard to the nature of the deposited metal, it is essential that the precipitated metal should adhere very firmly to the cathode, so that there can be no chance of mechanical loss by rubbing off the deposit. This firmness of deposit is obtained by employing a low voltage and low current density. It is not advisable to carry a voltage of less than 3, however, as with a very low voltage there is a tendency to precipitate *oxides* of the precious metals, which come down on the cathode as a jet-black deposit, which can be readily rubbed off and might be a source of serious loss.

Apart from the two foregoing reasons, which render the use of a weak current imperative, there is in my experience a tendency on the part of the current to precipitate on the cathode certain of the saline consituents of the electrolyte in the form of a scale. This is hardly perceptible with the weak current used, and does not interfere with the precipitation of the gold and silver; but the tendency increases with the curent density. With a current density of 1 amp. per sq.ft. of cathode surface, the effects are abundantly manifest, and the receptive qualities of the cathode for a metallic deposit are very seriously impaired.

Increase of efficiency of precipitation will not be gained by increase of current, but by *increase of electrode area*. For instance, the practice at the Reliance mill is to carry a current density of about 0.02 ot 3.03 amp. per sq.ft. of cathode surface. Increasing this current fivefold was not found to enhance precipitation at all. Given a certain rate of flow of solution, and a certain cathode area, a certain *percentage* of the precious metals will be precipitated. Provided that the rate of flow remains constant, the percentage precipitation will be independent of the amount of gold or silver present in the solution.

For example, given that a solution before precipitation assays $1.50 per ton in gold, and assuming that a given cathode area results in a precipitation of 80 per cent., so that the solution after precipitation assays 30c. per ton, if a solution assaying 30c. per ton before precipitation were passed through the same cathode area at *the same rate* the extraction would still be 80 per cent., and the solution leaving the tank would assay 6c. per ton.

Ratio of Precipitation

It is practically correct to state that the percentage precipitation is a function of the *rate of flow* of solution, and of the *cathode area*, and is *not* a function of the amount of gold present in the solution, or of the current.

To the metallurgist confronted with the most practical aspect of the matter, namely, the precipitation facilities necessary in any given cyanide plant, the following formula may be of use. It is the result of much experimental work.

Let R = rate of flow of solution through the precipitation tank, expressed in *tons per hour*.

Let K = the cathode area necessary to secure practically complete precipitation of the precious metals, expressed in *square feet*.

Then the following equation will hold:

$$K = 1750 \times R.$$

The equation holds, provided that: first, the electrodes are connected in multiple; second, the electrodes are of equal area;

and third, the distance between the anode and the cathode is 1½ in.

In calculating the value of K in this equation, it must be borne in mind that deposition takes place on both sides of the cathode; therefore K equals the sums of the areas of both sides of the cathodes.

Effect of Current on Cyanide Solution

The precipitation of the precious metals goes on quite independently of the strength of the cyanide solution. The question of the effect of the current on the cyanide solution is important. In the absence of sufficient protective alkali, there is an appreciable destruction of free cyanide. In my experience solutions containing just a trace of protective alkali lose about 30 per cent. of their free cyanide strength in passing over 3500 sq.ft. of anode and cathode area. On the other hand solutions containing a protective alkalinity of 0.03 per cent. CaO suffer no apparent loss of free cyanide.

Another reason for maintaining a high alkalinity is to retard the formation of Prussian blue. The latter results from the reaction of oxide of iron, formed by the action of the current on the anodes, with any ferrocyanide present in the solution. Prussian blue being soluble in caustic alkali, will not form, or, at any rate, not to anything like the same extent, if the solution is rendered sufficiently alkaline before passing through the precipitation tanks. Moreover, the anode product is then principally ferric hydrate, which rises to the surface of the solution, and may be readily disposed of, in the manner described. Should Prussian blue be formed its removal is more difficult, as it is of greater density than the solution, and accumulates at the bottom of the anode compartments.

There is always a loss of alkalinity in the passage of the solution through the precipitation tanks due to the reaction of Prussian blue with the alkali. The extent of this loss will be governed by the electrode area, and the current carried. By determining the protective alkalinity existing in the solution before and after precipitation, the exact consumption of alkali, due to any given electrode area and current may be determined.

When the solution in a precipitation tank is at rest, that is, when no flow is taking place, evidences of electrolytic action appear uniform throughout the tank; but when there is a continual flow of solution through the tank, the normal condition of things, there is no marked outward evidence of electrolysis at the inlet end of the tank, although deposition takes place on the cathodes. Outward signs of electrolytic action become more and more marked toward the outlet, where they reach a maximum. This is the reverse of what happens in the case of zinc precipitation, and is presumably due to the solution becoming more and more ionized as it passes through the tank.

Surfaces of Cathodes

It is essential that the surfaces of the cathodes be free from any trace of grease or oxide. At the Reliance mill the practice is to dip the lead sheets momentarily in a slightly acid solution of zinc chloride, before placing them in the precipitation tank.

The anodes and cathodes should be of similar shape and of the same area. Nothing will be gained by having the cathode of greater area than the anode, since deposition on the cathode is confined to an area similar and equal to that of the anode.

The solutions at the Reliance mill are maintained at an average temperature of 70 deg. F.

In the application of electrical precipitation at the Reliance mill, the following features were rendered strikingly evident: Precipitation is practically complete. Tailings solutions assay from a trace to a few cents per ton in gold. All assays of solutions for gold were made by the evaporation method, 10 assay tons being taken for the assay. The amount of attention required is very small. A "clean-up" can be effected easily. Cathode sheets may be removed at any time, and replaced by fresh ones, without interruption of the process.

The fair terms offered the mining company by the smelting works at Trail, in the matter of lending the cathode sheets contributed largely to the financial success of the process.

Detection of Willemite by Phosphorescence

By Edward K. Judd*

That the interesting laboratory phenomenon of today may become the valued engineerng asset of tomorrow has recently received demonstration in a new quarter. It has been known for some time that specimens of certain minerals from particular localities, among them diamond, kunzite, fluorite and willemite, show, when illuminated by ultra-violet light, a marked phosphorescence; but it has remained for George C. Stone, chief engineer of the New Jersey Zinc Company, to apply this physical fact to the practical working of his concentrating plant.

Franklin Furnace, N.J., is noted for the wide variety of its minerals, but the bulk of the zinc ore is a granular mixture of franklinite, zinkite and willemite, the principal gangue minerals being calcite and garnet. The ore first goes under a magnetic separator, the first pole of which removes most of the franklinite, while the second attracts the garnets and the remainder of the franklinite, leaving a mixture of zinkite, willemite and calcite to be separated by subsequent wet processes. The zinkite gives no trouble, but the willemite, having a comparatively light weight, tends more strongly to pass off in the tailings. The amount of its presence in the tailings has been a matter of considerable uncertainty, since the willemite has no striking characteristics to distinguish it from calcite, especially in the sand tailing of a fine jig or a table. The duskiness of the average jigging room, too, adds to the unreliability of a visual inspection. The detection of willemite in the mill tailings has now become the easiest part of the operation, thanks to this peculiar behavior of the mineral under ultra-violet light.

The apparatus is simple. Two heavy, half-round copper bars, insulated from each other, are held together at one end by a porcelain tube, which serves as a handle and as a container for resistance coils. The other ends are separated by a space of 3 in., making a thing much like a large tuning fork, about a foot long. Each prong is drilled, not far from its end, and a wrought-ron screw, provided with a milled head, is inserted through each, the points of the two screws abutting near the middle. The handle ends of the copper bars are connected with the two wires of an ordinary 110-volt electric-lighting circuit.

When the current is turned on, an arc forms between the iron poles, the light of which is rich in actinic, or ultra-violet rays. If this arc is then brought to shine upon a crushed ore containing willemite, the fragments of this mineral will glow brightly with an apple-green luminosity, standing out sharply by contrast with the fragments of the inert materials. Some specimens of the Franklin Furnace willemite are so violently affected by the phosphorescenece that they continue to glow for some moments after the excitation has ceased.

This detector has revealed some unsuspected features of milling operation. It was generally supposed at Franklin Furnace that the coarse jigs were less efficient in saving willemite than the fine, whereas the tailings from the fine jigs are now seen to be the richer in willemite, and the system of crushing and sizing has been modified accordingly. The darkness of the jigging room is now an advantage instead of a drawback, so far as concerns the detection of losses, since it aids the luminosity of the zinc material. It is possible not only to detect the presence of willemite in a tailing, but to gain a close idea as to its amount, so distinctly can the mineral be seen by this means. Indeed, as a control over the tailings, this method of inspection is even more serviceable than a chemical analysis, since some of the tailing minerals, whose rejection is eminently desirable, contain zinc. They do not, however, respond to the ultra-violet light.

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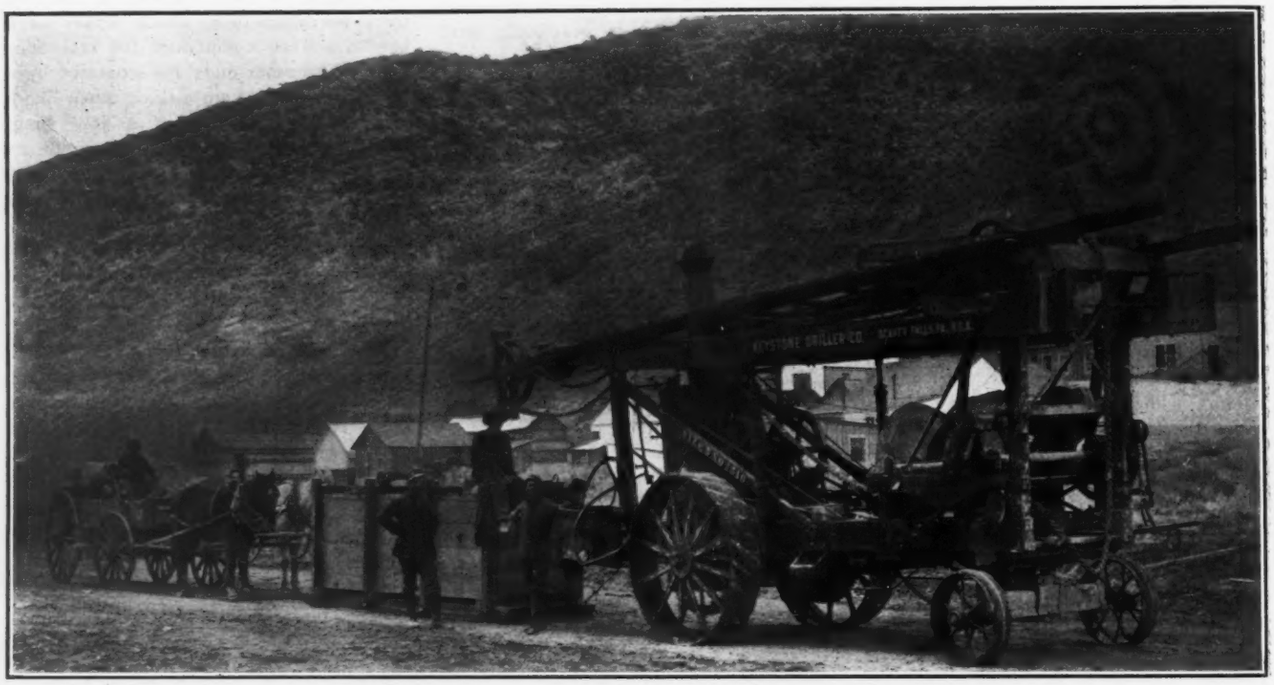
Prospecting with Keystone Drill for Copper Ore in the Ely Nevada District

By C. E. Hart

The ore deposits of the Ely district are extremely favorable for locating and developing with a churn drill. They consist of large irregular bodies of sulphide ore, with an average of about 2 per cent. copper and a little gold. Having had an extended experience with these drills in the Joplin district, where the lead and zinc deposits occur in a similar form, I was requested by the Ely Central Copper Company to ship two No. 3 Keystone drills to Ely and place them in operation.



KEYSTONE DRILL IN TRAVELING RIG

The order for these machines included an equipment of tools and spare parts, as also a complete outfit of fishing tools to recover any lost in drilling.

The drills arrived at Cherry creek, the terminus of the railroad, on July 29, 1906, and were taken overland to Ely, a distance of about 60 miles. In moving the machines the greatest trouble was experienced in keeping them supplied with water, and this finally necesitated the use of teams for the last part of the distance.

Local Requirements

As these drills are operated by steam, the question of water supply was a serious one. The few shafts that have been sunk to the water level had but a small flow, and there are very few springs in the district. A temporary supply was secured from the pipe line of the Nevada Consolidated Copper Company, and later a complete gasolene pumping plant was installed in a hole that had a fair flow of water at a depth of 65 ft. The drills required an average of 8 bbl. of water for each shift of eight hours, and an average of ¾ cord of wood for the same time, the wood being soft white pine and cedar.

The drills were set up and started on the Webber claim of the company on Aug. 17. The first hole was completed to a depth of 308 ft. on Sept. 9. The drills were operated a part of these 23 days on 10-hour shifts and a part of the time on 8-hour shifts. Including all the time expended on the hole, the average number of feet drilled per shift was 13.3. The average depth drilled per shift while the drill was actually in operation was 19.5. In drilling about 5000 ft. we later found the average, including all the time lost in moving and erection at a new location, to be about one foot per hour.

The greatest amount of drilling done on one shift was 54 ft. in 9 hours. This was entirely in rhyolite, a formation that is ideal for this sort of work. It drills very easily and is homogeneous enough to retain its shape without caving. The porphyry is too soft to stand up under the wash of the water in the hole and caves badly. The limestone formation is almost always tilted enough to make the drilling of a straight hole a very difficult matter. In these last two formations it is necessary to keep the hole carefully cased off.

As it happens the easy ground to drill, rhyolite, has never been known to carry anything of value, and so far the limestone has shown but few traces of ore. The orebodies developed are entirely in the porphyry formation. Some of the holes have penetrated the rhyolite and gone into the porphyry below, but they have without exception shown material of little value.

Expense and Weather

In January and February the cost of everything is at least a third more than during more favorable months. Portable houses have been erected around the drills and the men work regardless of the weather, but the cost of all supplies and outside labor are much higher in the winter.

In wet weather there are practically no roads and then teams must be used to help the traction gears move the rigs. In the summer it costs about $60 to move from one location to another; in winter the cost is increased to $150 to $200. All this adds to the cost per foot.

When the first two No. 3 machines were ordered, a maximum depth of 350 ft. was expected to be sufficient, but it was found advisable to go to greater depth, and three additional machines were ordered. These are of the same type, but two sizes larger, known as No. 5. The No. 3 drill weighs about 5000 lb. less than the larger machine, but it is too light for the rough work and a greater depth than 400 ft. These rigs are equipped with traction gears and cog hoists.

After watching the operation of these machines, twelve others of the same type have been purchased for development work on neighboring properties; it is more than probable that at least twenty of these drills will be in operation in the Ely camp during the coming summer.

As the value of the drilling depends en-

tirely upon the accuracy of the sampling, extreme care is necessary in taking assay samples. The entire contents of each pumping taken from every 5 ft. of depth, after the drill is in the ore bearing formation, is put in large iron wash tubs. The water is then evaporated off, by means of a slow fire and after the contents are thoroughly dried the sample is crushed fine, quartered, and an assay sample of about 10 lb. is sent to the chemist.

The sulphide ore is found at a depth of about 80 ft., and extends down to 200 and 300 feet.

Costs

The costs of two holes, one drilled in September and the other in February are given in a table at the end of this article. The first hole had all weather conditions in its favor, in the second case the conditions were unfavorable; the first is in rhyolite, the second in porphyry. Twenty holes were put down for this company with a total drilled depth of 3294 ft. These holes were drilled in September, October and November, and the costs were much less than for the same work in the winter time. It is calculated that the items of maintainance and depreciation shall be large enough to write off the first cost in four years.

COST OF DRILLING, FIRST HOLE.

NUMBER OF DAYS, AUG. 17—SEPT. 9, 23 DAYS.

SIX DAYS, 10-HOUR SHIFTS.	
One drill man at $125 per month...	$24.18
One drill helper at $100 per month	19.32
SEVENTEEN DAYS, 8-HOUR SHIFTS.	
One drill man at $125 per month...	68.51
One drill helper at $100 per month	25.76
One drill helper at $120 per month	36.00
Fuel, ¾ cords per shift @ $4.50 per cord	77.51
Water, 8 bbls. per shift at $6.50 per day	100.75
Oil, 1 gal. engine, 1 gal. cylinder...	2.20
Blacksmith coal, 200 lb. at $54 per ton	5.40
Miscellaneous charges	162.65
	$534.48

Average cost per foot for 308 feet, $1.73 5

SECOND HOLE.

NUMBER OF DAYS, FEB. 6, MAR. 7, 29 DAYS.

Three drill men at $4 per shift.....	$107.50
Three helpers at $3.25 per shift....	108.80
Superintendence	86.40
Blacksmith coal	8.80
Oil, engine and cylinder	3.18
Water	72.10
Wood	72.10
Maintenance, depreciation	14.33
	$478.31

Average cost per foot for 160 ft., $2.98.

Six days time was lost on the second hole while waiting for casing. The porphyry caved badly preventing the gaining of greater depth. More than one third of the total time was taken up in casing the hole.

The British House of Commons, on March 22, by 150 to 110 votes, rejected the bill purposing to introduce the metric system into Great Britain. Lloyd-George, president of the Board of Trade, in behalf of the Government, said the adoption of the system would be a dangerous and costly experiment by which Great Britain would lose the advantage which she now possesses in foreign markets over her metric system competitors.

Treatment of Tonopah Ore

In 1905 the Montana-Tonopah Mining Company forwarded trial shipments of ore to various metallurgical establishments in California and other Western States with the view of arriving at the most suitable method of treatment of Tonopah ore which is a dry auriferous-silver ore. The results were not very satisfactory, so Francis L. Bosqui, the well-known cyanide expert of San Francisco, was called upon for advice. According to a recent statement issued by the company, Mr. Bosqui has reported as follows:

"In the early part of 1906 I directed a series of milling and cyaniding tests on a carload of average milling ore from the Montana-Tonopah mine. These tests were made in San Francisco, and were completed at the time of the fire; but all records of this work were destroyed. The average extraction obtained by concentration and cyaniding was 87 per cent. Later in the year I supervised another series of tests in Denver on a carload of similar ore and confirmed the results obtained in the San Francisco tests, obtaining the same average extraction, and, by renewing solutions during agitation in the cyanide work, obtained a recovery of over 90 per cent. I doubt, however, if the latter result could be attained in actual milling without prohibitive cost per ton, and consider that an extraction ranging between 85 per cent. and 90 per cent. is the best that can reasonably be expected from the mill.

"On the basis of these experiments a 40-stamp mill was designed in the fall of the year, and the orders for machinery and supplies placed. The process decided upon is as follows: Crushing to ¼-in. ring in a series of Gates gyratory crushers, using one No. 5 and two No. 3 machines. The ore is elevated to the mill bins on a belt conveyer, whence it passes to eight batteries of five stamps each, provided with 12-mesh wire screens. It is expected that the service of these stamps will be between 150 and 200 tons in 24 hours. The product from these stamps is classified, the coarse material passing to eight Wilfley tables, while the slimes and fines go to two Dorr classifiers which precede the tube mills. The tails from the Wilfleys also go to these classifiers, whence the coarse product goes to the tube mills for regrinding. It is proposed to grind to 150 mesh in these mills, of which there are two, each 5x22 ft. The reground product from the tube mills joins the overflow from the Dorr machines, and the whole product then passes to two large cone classifiers. The underflow from these cones goes to 16 Frue vanners and the overflow joins the stream of tailings from the vanners and runs to the settling tanks in the cyanide plant. From the settlers the pulp is taken as required to the agitators, of which there are six of the Hendryx type. After agitation in a cyanide solution the pulp is drawn off to a large reservoir, where it is stored for filtering by means of the Butters vacuum filtering process. The gold- and silver-bearing solutions recovered from the Butters filter will be precipitated on zinc-dust in the Merril precipitation press, which has been so successfully used at the Homestake mine.

"All lumber and equipment for the mill were promptly delivered, but the work has been seriously delayed by several consecutive weeks of bad weather, during which time work had to be suspended. Lately, however, good progress has been made. Under favorable conditions this mill would have been finished about April 15, but it is doubtful now if it will be ready much before June 15.

"This mill will be thoroughly modern in all respects and embody the latest practice both in milling and cyaniding. Owing to uncertain labor conditions, as well as the high cost of labor in the Nevada fields, it was difficult to estimate the total cost of labor on the mill. Moreover, the working drawings were not completed until some time after the order for the bulk of the machinery had been placed; and consequently it was impossible to submit an accurate estimate of the cost of the mill, which would include the building proper, shafting, belting, piping, etc., and many other details which developed in the course of working up the drawings. The first provisional estimate placed the probable cost at $150,000, but the mill will cost in the neighborhood of $200,000 when completed."

In addition to the above mill the Tonopah Mining Company is erecting a 100-stamp mill at Miller's Siding, 17 miles west of Tonopah. At present 60 stamps are in operation and the returns are reported to be satisfactory. Another unit of 20 stamps is nearing completion and in the course of a few weeks the mill will be operating 70 stamps with a capacity of 400 tons daily.

In addition to the above mills the Tonopah Mining Company is also operating a small plant in Tonopah, known as the Midway mill.

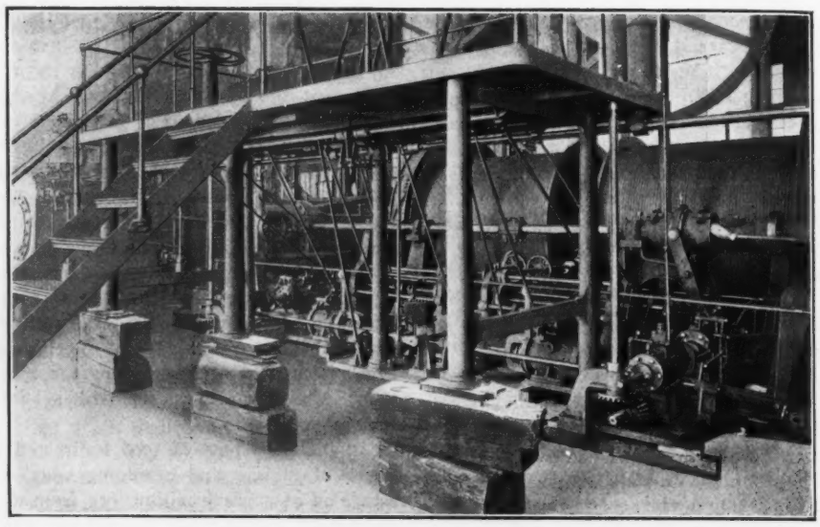
The *Revista Minera* states that an amalgamation of the San Miguel Copper Company, Huelva Copper and Sulphur mines, Peña Copper Company, and San Platon Company, in the province of Huelva, Spain, is under consideration. The scheme emanates from the Compagnie Auxiliaire des Mines and the Metallgesellschaft of Frankfort. Negotiations are not yet concluded, but it seems certain that the San Miguel and Peña companies will be amalgamated under direction of the Compagnie des Mines d' Or at de l'Afrique du Sud.

The Sullivan-Corliss Hoisting Engine

The Hancock Consolidated Copper Company has recently ordered from the Sullivan Machinery Company, of Chicago, a hoisting engine to be used for sinking the principal shaft at its mines, Hancock, Mich., and for permanent service, after the shaft is completed to its final depth of 4000 ft. The hoist will be of the first motion, heavy duty, Corliss type, with engines 24 in. in diameter by 48 in. stroke, and will have two loose drums 8 ft. in diameter by 9 ft. long, driven by band friction clutches, and designed for hoisting in balance. The drums will be grooved for 1¼-in. steel rope, and the maximum hoisting speed under full load will be 3500 ft. per min. The clutches and band brakes will be steam operated, with automatic compressed-air substitution in case the steam pressure falls below a given point, owing to accident or for other reasons.

The hoist will be fitted with the Sullivan patented automatic throttle-closing device and interlocking automatic stop. The steam will be automatically shut off at a fixed distance from the top of the shaft, allowing the engineer to bring the cage to a stop at the desired point, by use of the brake. In case the engineer, for any reason, fails to set the brakes, they will be set automatically at the proper point, to prevent an overwind.

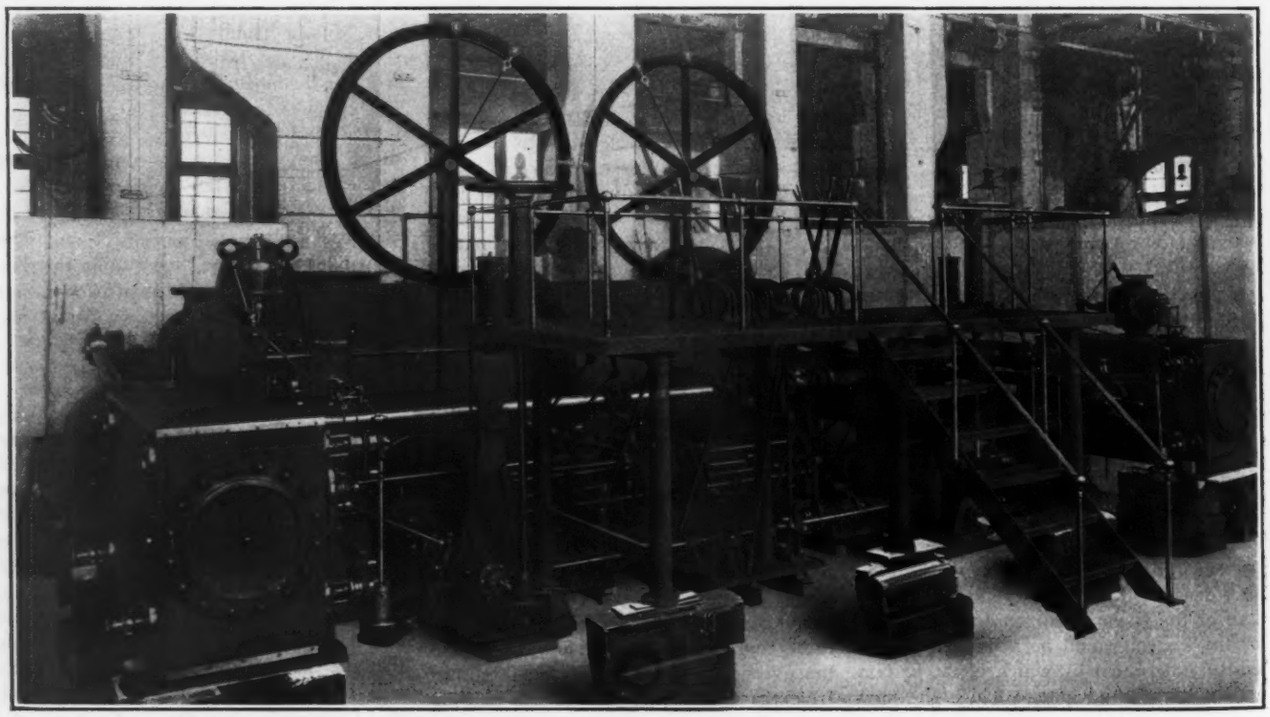
The throttle-closing device consists of a traveler on a spiral screw. This traveler is controlled by and revolves in unison with the drum. When it reaches a certain point in its travel, it automatically throws a lever which shuts off the steam. The brakes are set in a similar manner, in case the engineer fails to apply them in season to stop the hoist at the dump. When this occurs, a dog is released which locks the mechanism so that steam cannot be admitted until the engines are reversed, and the engineer leaves the platform and replaces the dog by hand.



SULLIVAN HOISTING ENGINE, AUTOMATIC-STOP MECHANISM

As to the practical efficiency of the automatic-stop mechanism it is said that the manager of one of the large mines in the Lake Superior iron region, where it has been in use for some time, has such confidence in it that when he has visitors at his mine he instructs the engineer to start the hoist under full working conditions, then calls him off the platform and lets the hoist do the rest.

According to the *Electrical Review* investigation has shown that various alloys of manganese, copper and aluminum possess magnetic properties, although they contain no metal of the so called magnetic group. These alloys have upset the theory of magnetism formerly held. The most promising view now is that magnetism is a molecular property, a property of groups of atoms or groups of molecules rather than of single atoms alone.



SULLIVAN-CORLISS HOISTING ENGINE

Reverberatory Smelting Furnaces of the Washoe Plant

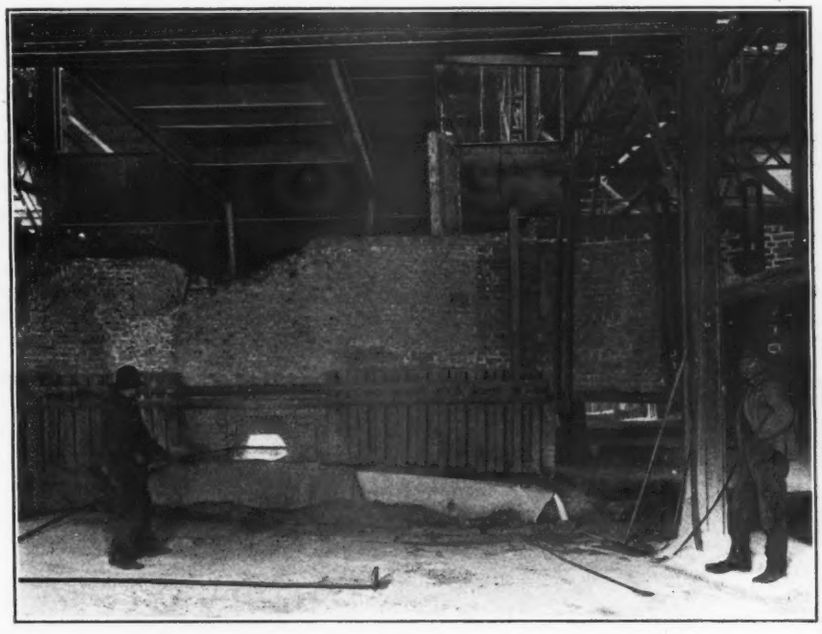
The reverberatory furnaces of the Washoe works, described by members of the Anaconda Copper Mining Company staff in an illustrated pamphlet, are four in number. They are coal-fired and the hearth dimensions are 19 ft. in width and from 102 to 116 ft. in length, with a grate area of 8x16 ft. and a smelting capacity of 300 tons per 24 hours, on natural draft.

The fuel used is Diamondville coal, shipped from the mines in Wyoming, owned by the Washoe Copper Company. The coal is dumped into hoppers that have four points of discharge directly over the fire-box. It is the custom here to charge the furnaces from the first two hoppers next to the bridge-wall of the furnace and to use charges weighing about 15 tons.

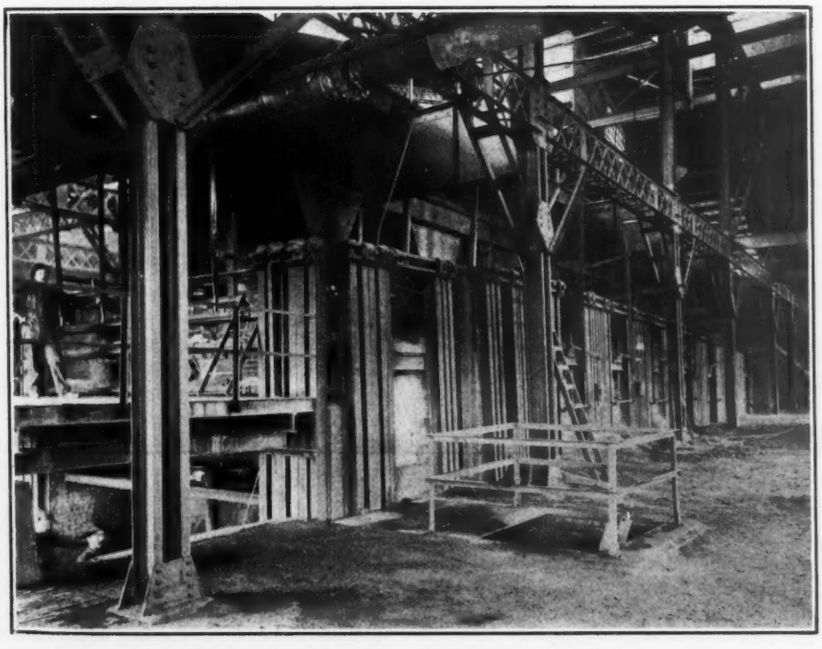
The flame, after leaving the furnace, passes through two 375-h.p. Stirling boilers, in tandem, which reduce the temperature of gases going to the main flue to about 600 deg. F. By this means 600 h.p. are obtained from each furnace from the waste heat.

The slag is skimmed from the reverberatories twice in 8 hours; it is allowed to accumulate until its depth is from 3 to 4 in. above the skimming plate in the front of the furnace and then skimmed into a stream of slum water, which granulates and sluices it through a cast-iron-lined launder to the slag dump. By allowing the slag to accumulate in the furnace in this manner it is possible to skim the furnace very rapidly, as much as 60 tons of slag being removed in 20 minutes. By this method the actual use of a rabble to pull the slag is avoided, the rabble being used to keep the bay clear of floating pieces of unfused silica and to prevent the flow from being more rapid than the water can handle properly.

The matte is kept down some distance below the skimming plate, making it impossible to pull out any of the matte, thus avoiding explosions. The matte is tapped from the side of the furnace, through copper tap-hole plates, and run through cast-iron launders, lined with silicious material, to hot-metal ladles of 10-ton capacity and taken to the converters. The brick used in the reverberatories are manufactured by the brick department of the company, located in Anaconda. The silica brick of that portion of the roof immediately over the fire-box and for a distance of 30 ft. from the fire-box lasts nine months and more. The remaining part of the roofs is still in good shape, having been in operation for two years. The brick are 15x6x3 in. It is the practice to clay, or fettle, the bridge-wall and sides where needed every 30 days. The bridge-wall plate is kept cool with a circulation of air by a pipe connection to the main flue.



SKIMMING REVERBERATORY FURNACE, WASHOE SMELTING WORKS



REVERBERATORY FURNACE, WASHOE SMELTING WORKS

"Bort" Diamonds may Enter Duty Free

The Court of General Appraisers has decided that "bort" diamonds are entitled to enter, duty free, into the United States. The case decided was that of the General Electric Company, which had protested against a duty of 10 per cent. on the ground that the diamonds were for industrial purposes and not for jewelry. Importers contended that, although the stones were diamonds, cut but not set, they were a particular kind of diamonds known at "bort" and as such, were entitled to free entry under paragraph 545.

It is understood that a case will shortly be heard involving the proper classification of miner's diamonds which, under the peculiar phraseology of paragraph 545 would seem to be excluded if cut, split or otherwise advanced in value or condition.

Up to April 1, 1906, there were in German mines and metallurgical works 391 gas-engine plants, with a total capacity of 416,000 h.p., the largest capacity of a single gas engine being 5000 horse-power.

Mining in the Cumberland Gap Coalfield

This Kentucky District Promises to Become an Active Competitor in Supplying the Markets of the Southern States

BY JOHN LEGGETT PULTZ*

The Cumberland Gap coalfield lies in the central portion of the Appalachian coal basin in the southeast corner of Kentucky and in Claiborne and Campbell counties, Tenn. It is a long, narrow basin varying from 15 to 20 miles in width, and extending in a northeast-southwest direction for a distance of about 90 miles along the eastern portion of the Appalachian coal basin. The field includes a deeply dissected region, made up of ravines and steep ridges, which attain hights of 3000 ft. in the vicinity of Cumberland Gap.

Louisville & Nashville railroads, penetrate into the heart of the coal measures. Delevopment of the district began with the completion of the railroads in 1892. The mines are tributary to Louisville and Cincinnati by the Cumberland Valley branch of the Louisville & Nashville Railroad, and to Knoxville by the Southern Railway.

Geological Sequence

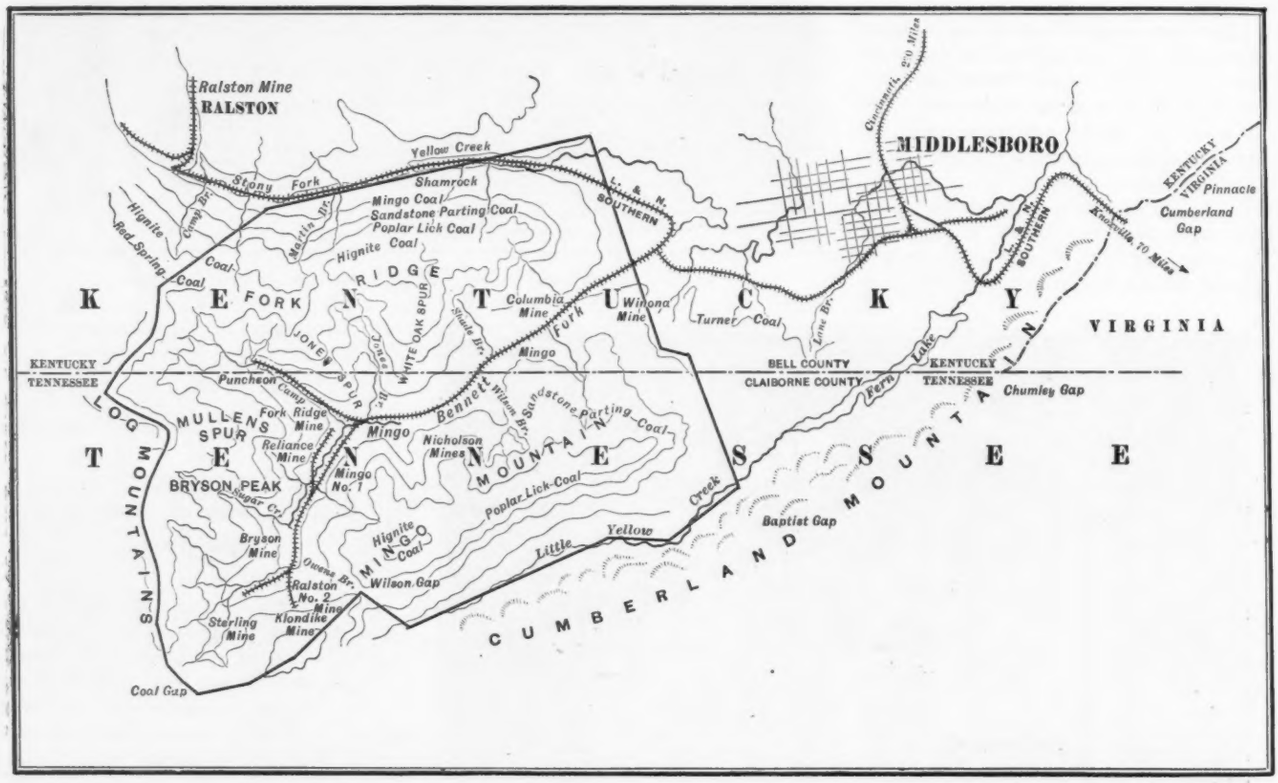
The coals of the Cumberland Gap field belong to the Pennsylvania series. There are six or seven workable seams of coal, which underlie considerable areas in the district just defined. The condensed section, Fig. 1, shows the principal seams and the intervals between them.

GEOLOGICAL SEQUENCE OF THE SEAMS.

Red Spring coal	5 ft.
Interval	440 ft.
Lower Hignite coal	5 ft.
Interval	300 ft.
Klondike Coal	5 ft.
Interval	50 ft.
Poplar Lick coal	4 ft.
Interval	230 ft.
Sandstone Parting coal	4 ft.
Interval	285 ft.
Mingo coal	5 ft.
Interval	440 ft.
Upper Bennett Fork coal	4 ft.
Interval	8 to 16 ft.
Lower Bennett Fork coal	4 ft.
Interval	200 ft.
Turner coal	4 ft.

The Turner seams outcrop on the extreme eastern slopes of Mingo mountain, and a short distance west disappear beneath the surface. They are not seen again in the district, for they underlie the surface at considerable depth. These seams must therefore remain unknown quantities over the greater part of the district under discussion until careful drilling tests are made. The further exploitation of the Turner seams, however, would not be practical for some years to come as there is abundant coal in the numerous beds outcropping higher in the hills which are accessible and afford better opportunities for economic mining. The only place where this coal is worked is at the Turner mine, about one mile southeast of Middlesboro.

The Bennett Fork seams lie about 200 ft. above the horizon of the Turner coal. They occur near the base of Fork Ridge and Mingo mountain, outcropping along their eastern escarpments and extending



MAP OF BENNETT FORK DISTRICT, CUMBERLAND GAP COALFIELD, KENTUCKY

Transportation Facilities

Owing to restricted transportation facilities, mining development has been mostly confined to that portion of the field lying about two miles west of Middlesboro, Kentucky. The district in which active mining operations have been carried on may be defined as comprising Mingo Mountain, Bryson Mountain, and Fork Ridge. This district is made accessible by way of Bennett and Stony Forks along the deep ravines of which the railroads operated jointly by the Southern, and

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up Bennett fork and Stony fork until these streams have no longer cut deep enough to expose them.

The Mingo Seam

The Mingo seam lies about 440 ft. above the Upper Bennett Fork seam. This is the lowest coal geologically that has practically a continuous outcrop in the district. Until 1903, the Mingo seam supplied the greater part of the output of the operations tributary to Middlesboro. The seam has a large acreage in Fork Ridge, Log mountain, and Mingo mountain. The best development of this coal is in the central part of the district where it yields from 4 to 5 ft. of workable coal. It shows one persistent parting a little below the center which varies from 6 to 8 in. in the mine now working this seam and attains a thickness of several feet near the boundaries of the district.

In character, the Mingo coal is soft and in consequence, the percentage of lump coal is small unless great care is taken in mining it. It makes an excellent steam fuel. At the Mingo mine it is washed and converted into coke. This is the only coking plant in operation in the district. The volatile combustible matter in this coal is high, and it should therefore be a good gas producer. The accompanying analysis compares the Mingo coal and the famous coal of the gas coal zone of the Pittsburg seam, near Monongahela City, Penn.

ANALYSES OF TYPICAL COALS.

	Mingo Seam.				Pittsburg Seam.	
Moisture....	4.40	0.12	3.11	0.91	1.223	1.280
Volatile Matter....	32.80	37.88	32.65	34.24	34.309	38.105
Fixed Carb'n	56.60	58.00	59.83	58.07	56.95	54.383
Ash.....	6.20	4.00	4.41	6.78	6.412	5.440
Sulphur.		0.824	0.824	0.750	1.076	0.792

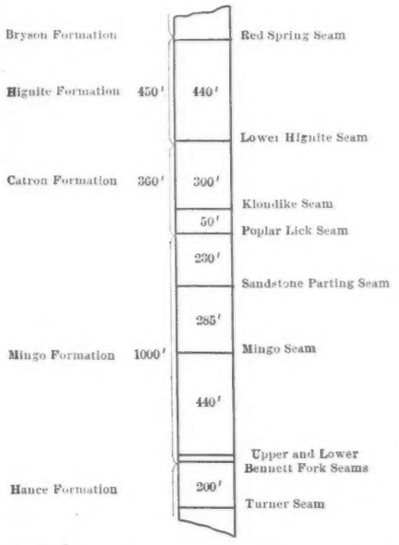
The Pittsburg seam at the locality mentioned has the reputation of being one of the highest grade gas coals in the country. The Mingo seam will probably not stand transportation as well as the Pennsylvania coal, but in other respects the analyses show it compares favorably in character with that of the Pittsburg seam. The low sulphur content in the Mingo seam is an important advantage in the manufacture of gas.

The Mingo seam is very soft and in consequence practically all the coal is mined by the pick without explosives. It is customary to mine first in the several inches of the soft seam or dirt band which occurs near the center. The dirt band is very soft and is mined rapidly. It is first dug out and thrown back behind the miners where it will not be mixed with the coal. The top coal is then easily picked down, or falls of its own weight as is often the case, and afterward the bottom coal is taken up by picks or wedges. If the seam is mined with care, there should be a fair proportion of lump coal.

The Sandstone-parting Seam

The Sandstone-Parting coal is the next seam above the Mingo which is now being worked in the district. This is the middle coal seam on Mingo mountain coming about half way between the Poplar Lick and the Mingo coals. The seam ranges from 3 ft. to over 5 ft. in thickness and is characterized by a thin sandstone parting the position of which varies in different parts of the field. In Mingo mountain there are three partings, two near the top and one near the bottom. In some localities these partings might make it impracticable to mine the entire seam.

The Sandstone-Parting seam is harder than the other coals mined in the district and should yield a larger percentage of lump than the Mingo seam. It is an excellent domestic and steam coal, low in sulphur, high in fixed carbon, and a fuel



SECTION SHOWING GEOLOGICAL SEQUENCE IN CUMBERLAND GAP REGION

ratio of 1.7. The ash content is probably somewhat higher than in the Mingo coal. The specific gravity of this seam is higher than that of the Mingo seam. As the miner is paid by the car and the mining rate is the same for the two seams, the initial cost of the Sandstone-Parting coal is somewhat below that of the Mingo seam.

It has been customary to shoot the seam in the solid or mine the coal on the mining seam near the top and afterward shoot. The former method shoots the coal to pieces and requires a large amount of powder which means a smaller profit to the miner. This seam is well adapted to electric chain machines which necessitate a good roof so that the rooms can be driven wide while the hardness of the coal makes it unsuitable for pick mining. The present mining rate for this seam is 40c. per ton for coal shot in the solid. The rate for machine coal is 30c. per ton. The pick rate for entry coal is 82c. per ton on a basis of $1.25 per yard and 40c. per ton for the three tons of coal to each yard. The cost of entry coal by machine mining on a basis of 32c. per ton would be 77c. It will therefore be seen that under favorable conditions of machine mining there should be a higher economic efficiency by the reduction in the initial cost of both room and entry coal.

The Poplar Lick Seam

The Poplar Lick seam occurs about 250 ft. above the Sandstone-Parting coal and is held in Fork Ridge, Mingo mountain, and Log mountain but does not underlie as large an area because of its higher elevation. The Poplar Lick is considered as a 4-ft. seam on Stony fork and generally workable and from 3 ft. to 4 ft. in thickness on Bennett fork.

Other Seams

The Klondike seam lies about 55 ft. vertically above Poplar Lick coal. It outcrops continuously in Fork Ridge, Mingo, and Log mountain as is the case with the coals between it and the Bennett Fork seams. It varies from 4 ft. to 6 ft. in thickness with a probable average of 4 ft. on Bennett fork and less than 4 ft. on Stony fork.

The bulk of the Hignite seams lie in Log mountain and Fork ridge, for there is only an isolated round top which holds this coal on Mingo mountain. The Lower Hignite coal ranges from 41 in. to 69 in. in thickness.

This seam is worked at the No. 3 mine of the Nicholson Coal Company. The coal is practically all shot in the solid. Rooms are driven 22 ft. in width and 250 ft. in length and the pillars are 23 ft. The Lower Hignite coal has been developed at few localities in the district. It possesses the qualities of a good fuel but its hight above the valley floor and its comparatively small area has made it of less importance than some of the lower seams.

The Upper Hignite seam has not been opened up sufficiently to prove its workable thickness in the Bennett Fork district.

The Red Spring coal underlies such a small area in Log mountain that with respect to the district under discussion it cannot be considered as having any important economic value.

The seams occurring within the district have each in turn been described. There are six or seven workable seams, all of which can easily be mined either from Bennett or Stony forks. Roughly speaking, the entire district is probably underlaid by two seams of workable thickness while the coals above outcrop continuously in the three ridges comprising the property.

These coals are good for domestic and steam purposes, and one at least, the Mingo, is an excellent gas coal.

Principal Mines in the District

The following list gives the names of the principal mines in the district and their locations:

Names of Companies.	Location.
Turner Coal.....	1 mile S. E. of Middlesboro
Winona Coal	Bennett Coal
Yellow Creek Coal..	" "
Columbia Coal.....	" "
Brickdale C. & C...	" "
Nicholson Coal....	" "
Mingo C. & C.....	" "
Sterling C. & C....	" "
Ralston Coal.....	" "
Bryson Coal.....	" "
Klondike Coal.....	" "
Reliance Coal.....	" "
Ford Ridge Coal...	" "
Edgewood C. & C...	Stony Fork
Shamrock C. & C..	" "
Ralstone Coal.....	" "
Luke & Drum'd S.	" "
Sagamore Coal....	" "

The mines have all been opened by drifts. In many cases, these occur high in the hills, and in consequence the coal must be taken down to the valley below along gravity planes or in retarding conveyors. At several operations, where the higher coals are worked, there are two planes, and the monitors on the upper plane dump into the monitors traveling on the lower plane.

In the case of the Nicholson mine, on Bennett fork, the mines are reached by two three-track gravity planes. The plane to the No. 2 mine is 2000 ft. in length, and the one from No. 2 to No. 3, or the upper mine, is 1500 ft. The coal from No. 3 is dumped into a bin at No. 2 mine tipple, where it is sent over a Jeffrey picking conveyer 60x4 ft., and into the seven-ton monitors running from the No. 2 mine to the railroad tipple in the valley below. The conveyor is operated by a 10-h.p. high-speed Atlas engine.

The Yellow Creek mine adjoins the Nicholson and the geological occurrence of the coal seams are similar. At this operation a four-track gravity plane extends from the valley to the No. 2 mine, a distance of about 1500 ft. In this case, however, the coal is brought from the upper to the lower mine by a retarding conveyer 600 ft. in length, operated by a motor. This conveyer saves much breaking of the coal, and in consequence a much larger percentage of lump reaches the tipple at the lower mine, where it falls into seven-ton monitors traveling on the lower gravity plane.

Methods of Mining

Farther up the valley the altitude of the seams above the creek decreases. At the Sterling mine, at the head of Bennett Fork, the gravity plane is 650 ft. in length.

At the Fork Ridge Coal Company, on Puncheon Creek branch of Bennett fork, the Mingo seam goes under water, and the mine has been opened up by a drift at a point to give sufficient tipple hight, and farther up the valley by a slope 175 ft. in length. At present the electric mine locomotives bring the coal trips to the foot of the slope, where an automatic double-track endless car haul conveys the cars to the slope mouth and across a trestle to the railroad tipple.

The method of mining employed is the room-and-pillar system. The coal at Sterling mine double main butt headings with 70-ft. centers is generally attached by parallel-face headings, with a 50-ft. pillar between them. At intervals of about 500 ft. cross headings are driven in opposite directions at right angles to the main heading, and the length of the rooms is consequently 250 ft. The width of the rooms and the size of the pillars vary in the different localities, and depend upon the conditions of the roof. At the Fork Ridge mine, one of the largest producers in the district, the rooms are driven with 40-ft. centers and 20-ft. pillars. The roof holds well, and props without cross-timbers are sufficient. No timbering is required in the main haulage roads at this locality.

Ventilation and Drainage

Ventilation is accomplished by furnaces in the newly opened mines, but in the larger workings exhaust fans are used. At the Sterling mine there is an 8-ft. disk fan driven by a 15-h.p. motor with automatic rheostat. A 7-ft. Stein fan operated by a 16-h.p. gasolene engine is in use at the Nicholson mine. The Fork Ridge operation has a 9-ft. Thayer exhaust fan with a capacity of 30,000 cu.ft., at 140 revolutions per minute.

The mines are generally self-draining, and little trouble is caused from water except during unusually wet periods. Both steam and electric pumps are in use to pump out local swamps underground. Two electric pumps are in use in the Sterling mine, one 3-h.p. pump, and the second a 15-h.p. centrifugal pump. The water that accumulates at the foot of the slope in the Fork Ridge mine is taken care of by two steam plunger pumps.

Haulage

Underground haulage is accomplished by mules and both steam and electric locomotives. The Sterling operation has an excellent electric equipment and there are two electric locomotives in use. In this mine the heavy motor roads are laid with 56-lb. rails and 30-lb. and 16-lb. iron is laid on the balance of the haulage roads. A system of block signals has been adopted along the main heading in order to insure safety and facilitate transportation. Specially constructed steam mine locomotives, similar to the ones in use in the anthracite district of Pennsylvania, run underground in the Nicholson mine. It is necessary to pump the water for these locomotives from the creek in the valley below and the vertical lift is probably over 600 ft. At the Yellow Creek mines, three seven-ton, 250-kw. locomotives operate on the main haulage roads. The Fork Ridge mine has an excellent haulage system. The grades are favorable and the alinement and construction such that trips can be run at full speed along the entire length of the main heading. Three 10-ton Jeffrey double end control locomotives are used underground and one Jeffrey gathering locomotive.

Power Plants

There is considerable variation in the power-plant equipments of the different mines; at many of the smaller and older mines, electricity has not been installed. Until recently electricity has been applied mostly to haulage. At the plant of the Sterling Coal and Coke Company electric chain machines have lately been put in use. The power plant at this mine consists of two 150-h.p. Atlas return tubular boilers, one 150-kw. Multiple Goodwin generator direct connected to an 18x19 in. McEwen engine. The voltage is 250. The Yellow Creek plant contains two Atlas boilers of 125 h.p. each, one McEwen engine, and one 150-kw. Goodman generator. The power equipment of the Fork Ridge mine consists of four Atlas boilers; two 250 h.p. and two 100 h.p. One 19x19-in. McEwen engine belt connected to a 150-kw. generator is used.

The Coal Markets

The greater part of output of the Middlesboro District is consumed by the railroads for steam coal. Up to the present time comparatively little domestic, gas, or steam coal for industrial purposes has been sold. In the open market, the Middlesboro coal should be an active competitor with the Big Stone Gap, the Jellico, and Coal Creek districts in northern Tennessee, western North Carolina, the northwestern half of South Carolina and northern Georgia. It would be in demand by gas companies in Kentucky, Tennessee, and points west.

In North Carolina and the northeastern portion of South Carolina the Middlesboro district and the three fields mentioned together with the coals of the Chattanooga districts will have to compete with the West Virginia fields. South, in Central Georgia and the lower portion of South Carolina the Birmingham coals will enter into competition.

As already stated, only a small amount of the total coal output of the district tributary to Middlesboro, is placed in the open market. With the rapid industrial development going on in the Carolinas and Georgia, there will be an increasing demand for domestic coal and steam coal for manufacturing purposes. The position of the Middlesboro district together with its excellent transportation facilities should make it an active competitor in their market.

During 1905 Brazil exported 9,762,038 pounds of monazite sands which ranged in thorium contents from 3 per cent. to 7 per cent.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

What is claimed to be a record day's winding of coal for any colliery in the United Kingdom was made on March 22, at the Bargoed colliery of the Towell-Duffryn Company. The quantity of coal raised during the working day was 3245 tons.

In the entire United Kingdom less than 3½ per cent. of the coal output in 1905 was produced by machines. The coal produced by these machines in 1904 was 5,744,044 tons, and in 1905 8,102,197 tons. There are 3,126 collieries in the United Kingdom, of which fewer than 10 per cent. use machines.

The steam consumption per i.h.p. in a good compound condensing horizontal engine driving a dynamo by means of ropes should be about 15 to 25 lb. per hour; if the steam consumption per e.h.p. comes to a high figure, such as 50 lb. per hour, it shows a great loss, and the object of the engineer should be to discover where this loss takes place.

Practical experience has shown that a range of beehive ovens will give off waste gas of greater heating power than a similar range of by-product ovens. One excellent authority states that sixty by-product ovens (30 ft. long by 6 ft. high by 2 ft. 6 in. wide) may be supposed capable of heating five 8-ft. boilers, the steam pressure being about 120 lb. per square inch.

The following is a table given by Professor Galloway, of South Wales, on tests made by a Davy safety-lamp for length of cap and percentage of gas:

Percentage of Gas in the Air.	Length of Cap.
2 per cent.	⅛ in.
2½ per cent.	¼ in.
3½ per cent.	⅜ in.
4 per cent.	½ in.
5 per cent.	⅝ in.
5½ per cent.	2 in.
6¼ per cent.	3⅛ in.

Experiments have shown that as a general rule, Australian coals are not specially liable to spontaneous combustion, with the exception of those coals that are rich in iron pyrites. If the pyritous portion, commonly known as "brassy tops" is exposed to the weather, there is then a liability to spontaneous combustion, and it is important for the working of the coal, that these "brassy tops" be absolutely got rid of in a mine if air is admitted at all to the seam.

The advantages of using high-pressure steam are: First, a reduction in the size of the steam pipe and engine; second, more work is obtained from the same weight of steam. These economies are secured by a small increase in the amount of fuel used. It requires 966 B.t.u. to convert one pound of water at 212 deg. to steam at 212 deg. F. (atmospheric pressure); while to convert it to steam at 100 lb. per sq.in. absolute only requires an additional 35.3 British thermal units.

It has been proved by experiments and practice that carbon dioxide gas is a more powerful extinguisher of flame than nitrogen; this may be due to its density, for 58 per cent. of CO_2 will extinguish a hydrogen flame. In testing mine gases having a few per cent. of CO, as in mine fires, by Shaw's gas-testing machine, it has been found that the apparatus does not give correct results unless the CO_2 is previously removed by passing it through a strong solution of potassium hydroxide.

English scientists have recently been carrying on investigations into the matter of coal dust and its bearing on explosions. The experiments show that the only certain arrestment of a coal-dust explosion occurs when there is an excess of dust, which smothers the flame through lack of air to maintain combustion. The most favorable atmosphere to encourage the spread of an explosion is that which contains a maximum percentage of water vapor and a normal quantity of floating coal dust. Watering dusty "roads" is considered no deterrent.

India produced nearly 9,000,000 tons of coal during the year 1906. In mining this quantity of coal, there were 80,496 persons employed, which shows that the average production per employee was about 96 tons. The United States produces 529 tons per employee; the United Kingdom 279 tons, and Germany has an average output of 307 tons for each person employed. It is conservatively estimated that the coal measures of India have an area of 33,000 square miles, which places this country as the fourth largest coal-bearing country in the world.

It is now common practice at a number of collieries to use inferior fuel in the generation of steam. In accomplishing this result, the general method is to apply forced draft to the ordinary boiler, and either dispense entirely with grate bars or place them very close together. Although this scheme has met with considerable success, it is also attended by numerous difficulties. Owing to the fine nature of the fuel, a considerable proportion is blown into the chimney without being burned, and, as the combustible matter has a lower specific gravity than the refuse, the most valuable part of the fuel is wasted.

Blasting powder and dynamite such as are often used in coal mines frequently generate carbonic oxide, CO, which gas is one of the principal causes of coal-dust explosions. In some cases, as much as 30 per cent. of carbonic oxide is produced by blasting powder. In one instance an analysis of gases after an explosion of powder was made by Hall and Orsman as follows: Oxygen, 3.9 per cent.; nitrogen, 75.9 per cent.; carbon dioxide, 12.1 per cent.; carbonic oxide, CO, 8.1 per cent. For the men in the mines to inhale such gases is extremely dangerous; besides its presence tends to produce a dust explosion. It is therefore important that much care be exercised in selecting explosives for use in coal mines.

The relative merits of rope- or belt-drive depend principally upon circumstances and convenience. With a rope drive there is less liability of break-down; ropes break singly, while a broken belt might cause a serious accident. The speed of belts and ropes is governed by the tension put on them by centrifugal force, and should not be more than 4000 or 4500 ft. per min. The power which ropes will transmit depends upon their number and speed, and can be calculated as follows: Multiply the square of the diameter of rope in inches by the velocity in feet per minute and divide by 300; the result will be the power which may safely be transmitted by one rope. The number of ropes should be at least one more than actually required, so as to allow for changing.

One of the Pennsylvania mine inspectors, believing that practical tests are of as much importance as a theoretical examination, has arranged a practical demonstration by which miners making application for certificates will have a chance to display their knowledge of gas. Suspended from a rope in the ceiling of a room provided for the purpose, this inspector has a large glass globe into which he turns a jet of natural gas, until it is filled. The windows are then completely darkened, and the interior of the room is identical with that of a gaseous mine, so far as light and atmospheric conditions are concerned. Each candidate for a certificate is given a safety lamp and required to work it in pure air, mixed air and gas. In this way it can soon be determined whether or not the men know the utility of the safety lamp, and are efficient in its use. This test is, of course, supplementary to the oral examination required.

American Institute of Mining Engineers

The Spring Meeting, April, 1907, the 92d Regular Meeting of the Institute, Held in the New United Engineering Societies Building

ADDRESSES, PAPERS, DISCUSSIONS

Following the dedication of the United Engineering Building, which was reported in the JOURNAL last week, the American Institute of Mining Engineers held its regular spring meeting, beginning on Thursday, April 18, at 2:30 p.m., in the auditorium of the new building.

The meeting was called to order by Prof. John Hays Hammond, President of the Council, who said:

"Before taking up the reading and discussion of papers I will call upon Dr. Rossiter W. Raymond, the oldest living past-president of the Institute, who has been in harness almost continuously for 36 years, and who has contributed more than anyone else to bring this society to its present great success and to establish the reputation of the American mining engineer the world over, for a few words supplementary to those which were uttered to engineers generally during the sessions of yesterday and the day before."

Dr. Raymond spoke as follows:

"The arrangements for this meeting having been made during my absence by Dr. Struthers, the assistant secretary, who remains in charge, will be conducted by him; and therefore I feel free to speak as a past-president, rather than as an existing secretary, on this occasion. The Darwinian doctrine of the survival of the fittest is sometimes illustrated by persons who are supposed to be the fittest because they have simply survived. I fear that I come under that category. Almost all of my contemporaries in the early history of this institute have passed away. Only one or two of the original founders remain, and I may fairly say that scarcely any remain who were active at that time in shaping the organization and the future career of the Institute.

"In 1871 I was was just 31 years old. Next week I shall be 67 years old. All the intervening years have been devoted to the service of this Institute almost continuously, either as president or vice-president or secretary. You may easily imagine, therefore, with what pleasure I greet you on this ocasion.

EARLY DAYS OF THE INSTITUTE

"I am not here to extend to you the welcome of the city of New York. We have met here over and over again; and we have always had a mayor or some other public functionary to extend to us, as guests of the City, its hospitalities and courtesies. You will never be thus welcomed to New York again, for it is now your home. You enter this day, for the first time, the place that belongs to you. For more than 30 years the Institute was not incorporated, or located anywhere. The very nature of our society was such that we could not without peril to its future tie it specially to any one locality. Comprising as it did a membership most widely distributed, both geographically and professionally, it had no more right to exist in one place than in another; and an attempt to place it at one spot would simply have been a signal for the appearance of other local societies in other spots.

"This is not the time and place to go into a long history of that critical question; but I may say that there was a time when this Institute ought to have been located, if anywhere, in Philadelphia. To the present day, Pennsylvania is far more distinctly a mining State than New York. There was a time when there was danger of the establishment of some rival Institute in the West. There have been times when it was very plausibly proposed to start other national societies, especially for iron and steel and coal. Through all that period the Institute, by being peripatetic, kept itself national. Its office was first at Lambertville, New Jersey, where the first secretary, the late Martin Coryell, happened to reside. When Dr. Thomas M. Drown became the secretary, the headquarters went to Philadelphia, without any vote on the part of the members or the council, simply because the secretary lived in Philadelphia. When Dr. Drown became a professor in Lafayette College, the Institute, in similar informal fashion, went to Easton; and when I succeeded Dr. Drown, the Institute came to my office in New York. For many years, the institute never owned so much as a chair; it was in my private office that its business was done. Headquarters could have been moved, or, rather, would have moved themselves, at any time, if the wholesome and brilliant thought had ever struck you to choose another secretary.

THE NEW HOME OF THE SOCIETIES

"The munificence of Mr. Carnegie, extended when the lapse of time had shown the true intent and purpose of the Institute, and allayed once for all every possible local prejudice or ambition, made it possible for us to join in the movement which has ended in the acceptance and occupation of this splendid building. To do that, it was necessary that we ourselves should be incorporated, and that another corporation should be formed, to hold and administer the building in which we were to become tenants. United Engineering Society is not strictly a society at all. It is simply a board of nine eminent and trustworthy trustees, elected (three from each of the Founder Societies) to hold and administer this building. I need not characterize its legal title as an unfortunate misnomer, unless it should lead to embarrassing misapprehension on the part of foreigners, through the inference on their part that a new society, constituting an organic union, has come into existence.

"We Americans know very well that our three societies are the same old organizations, and have joined in the creation of this business board simply to take care of the real estate represented in this building. We occupy our several quarters in the building in a spirit of absolutely free and voluntary fraternity, without any superior authority over us; without any limitation of our organizations, our purposes, or our methods; and without any submission to outside control.

"I deem it important to say this, because our Institute has always differed from the two sister societies in the character of its organization, in the wider distribution and less stringent requirements of its membership, in the practical omnipotence of its governing body, and in the limitations of that absolute power to definite purposes, excluding all action or utterance whatever, in support of any theory, movement, enterprise or purpose, outside of the holding of our meetings and the publication of our proceedings. We are a free forum for information and discussion. We never allow any committee of ours to come to any conclusion that we must adopt. Thus, in many respects, we stand on our own platform, pursue our own purposes by our own methods, recognizing, meanwhile, that the more select societies, such as those of the Mechanical and the Electrical Engineers, which have sprung from our loins, have methods and systems of their own which are doubtless best for them. I wish the members of the Institute from all parts of the country to recognize, once for all, that we have sacrificed nothing of our individuality or antonomy by this new, close and cordial fraternal union.

CREDIT WHERE CREDIT IS DUE

"Moreover, I desire to express for our Institute, not, of course, attempting to speak for the others (though confident of their assent), the feeling that, in the numerous formalities and crowded proceedings of the recent dedication, certain acknowledgments were omitted, which, so

far as we are concerned, we wish to supply. We desire to put on record our thanks, by name, to the members of the conference and building committees who did our work on those committees. I have no doubt the other societies will take the opportunity to make similar acknowledgments to their own members, and I do not now extend thanks to any of their members, because it is their business to do it! But, from President C. W. Hunt down, the members of those committees were altogether too modest in the dedication exercises. They did not give us a chance to blow their trumpets, and they did not blow their own trumpets; and consequently the men that did the most have had, so far, very little recognition. As Secretary of the Institute, and intimately acquainted, though not personally concerned, with the progress of all this delicate, difficult and complicated work, I wish to emphasize the names of the three members who represented us for the most of the time—Dr. A. L. Ledoux, Charles Kirchhoff and Theodore Dwight.

"And I wish to emphasize still more strongly a name that has not been heard on this platform, I regret to say, since the dedication exercises began. When, from numerous anonymously offered designs, the building committee had selected, with a unanimity amounting almost to inspiration, the plans for this building, they found that the names signed thereto were those of Herbert D. Hale and his associate, Henry G. Morse. Mr. Hale, as I am informed, has been absent from all these exercises by reason of illness. Nobody that ever met him can doubt the brilliancy of his genius and the breadth of his culture; and we recognize the permanent stamp of both in the design and details of this edifice.

A Clean Record

"Mr. Morse, the son of an eminent and beloved member of the American Institute of Mining Engineers, assumed in this case more than the duties of a clerk or the work of an inspector. Mr. Morse practically camped on this building; he spent his days and nights here; he scarcely forsook it during the whole period of its erection; and, without the least disparagement of the great genius of his brilliant associate and chief, Mr. Hale, I say it is due to Henry G. Morse more than to any other man that the record of this building is thoroughly creditable to us all as engineers. For engineers must not only *plan* things, but also *do* things. Now, we do not have to blush for a building which was not completed on time, or completed with the money provided, or the detailed specifications for which were not always ready when wanted, so that the contractor had the opportunity to make extra charges for errors, changes and delays.

"Any of you who have had to do with the erection of buildings knows what that means. All such delays, corrections and afterthoughts, warranting the claim of extra pay by the contracting builder, are merely so many evidences of somebody's lack of forethought or somebody's lack of promptness and fidelity. The record of this building is as clean as its walls. It was built as it was designed. Not an error in its plan has had to be corrected. In spite of a couple of those exhibitions of irresponsible tyranny known as sympathetic strikes, it was completed practically on time; and it was built with the money provided. Engineers can hold up their heads with pride in the thought that, somehow or other, through somebody's fidelity, this result was achieved. I would distribute the praise for it down through United Engineering Society and its building committee; but they will all heartily agree with me in naming, as chief of all these hearty co-laborers, Henry G. Morse. The stainless record of this construction is mainly due to him. Mr. Morse personally tapped every rivet in every plate or beam of this building. If anything had been covered up he had it uncovered; and hundreds of rivets which did not satisfy his stringent tests were taken out and replaced. In this and in many other particulars his enthusiastic, unselfish and efficient coöperation went far beyond his legal duties and obligations; and we owe it largely to him that the erection of this classic and stately, yet simple and thoroughly suitable structure, was a masterpiece worthily crowning its design.

The Key, a Symbol

"I am requested also to call attention to certain details which Mr. Olcott, past-president of this Institute and now president of United Engineering Society, accidentally omitted to mention, day before yesterday, in his remarks acknowledging the reception of the key to this building. Yesterday afternoon the President of our Council, Prof. John Hays Hammond, in a few fitting words, emphasized the priority of the mining engineer as the pioneer of all engineering progress. I would now emphasize not only that general leadership, but also, as regards the history which culminates in this occasion, the seniority of our Institute. The American Institute of Mining Engineers is practically the parent of the other two founder societies now nestling by its side. Twice we went to sleep; and when we woke up we missed a rib—and there was another society!

"This key fitly recognizes our primacy. The handle is made of gold from the North Star mine, at Grass Valley, California, which many of you have visited, and the president of which has been, for many years, James D. Hague, now Vice-president of the Council of the Institute, who kindly provided the metal for this purpose. It bears upon one side the three symbols representing the seals of the three societies. So far, it sets forth, as it ought to do, their good fellowship and brotherhood, uttered, however, in terms of the mining engineer, namely, in gold, with which the electrical and mechanical engineers have much less to do than we. But on the other side is the frank admission of that primacy upon which we never insist, unless it is by silence or contradiction implicitly denied! For there, in a little frame, covered with a bit of rock crystal, are two or three grains of the very gold washed by Marshall in 1848 from the waters of Sutter creek, in California.

"We owe not only the gift of these historic souvenirs, but also the documentary proof of their authenticity, to George F. Kunz, a New York member of the institute.

"It may interest you to hear that, many years after the great discovery, President Hammond went with Marshall, who was his good friend, to the same spot and panned out some more gold. So, you see, the American Institute of Mining Engineers is directly connected with the epoch-making event, which led to the conquest of a continent, and the inauguration of a new industrial age. Whoever, therefore, shall hereafter open the door of this building will acknowledge thereby the fraternal leadership of the American Institute of Mining Engineers!

"Comrades! as your servant and fellow, I welcome you to your own house. If I should live to be 100 years old instead of 67, my last hour of intelligent effort will be given to the service of American mining engineers. If I should die tomorrow, I shall have lived a happy life in that service!"

Mining in New York City

Dr. Raymond was followed by H. D. Hildage, of New York, who read a paper "On Mining Operations in New York City and Vicinity." He stated in his preface that there is more dynamite used in New York than in any mining district in the United States; that there are under construction about 38 miles of tunnels, and that 66 miles more are projected; that since 1902, at least 2,000,000 tons of earth have been removed in underground work, in addition to about 3,500,000 tons in open cuts in connection with tunnel work and many times this quantity has been removed in excavating foundations for buildings not connected with tunnel work. At the present time there are probably more than 5000 men engaged in mining work in and about New York City. Mr. Hildage then described, with the aid of stereopticon views, the methods employed in constructing tunnels under the East and North rivers. Mr. Hildage has been prominently connected with this work, and his mastery of the subject, which is of great interest, enabled him to make his audience conversant with the

details in a way that was highly appreciated.

At the session of April 19, Prof. Henry M. Howe read a paper on the "Influence of the Condition of Casting on Piping and Segregation as shown by Wax Ingots," of which he was joint author with Prof. Bradley Stoughton. This paper was discussed in an instructive and appreciative way by R. W. Hunt. Prof. James F. Kemp then read a paper on "The White Knob Copper Deposits," on which there was no discussion. Prof. H. O. Hofman read a paper on "Laboratory Experiments in Lime Roasting a Galena Concentrate, with reference to the Savelsberg process." Afterward he read a discussion of the paper by George A. Packard, of Rolla, Mo., who was not present at the meeting, and added some comment in reply. J. E. Johnson, Jr., then presented a discussion of the paper by Mr. Meissner on "Notes on the Gayley Dry Air Blast," in which he supported his previous contention that the Gayley process is of real efficiency, but is likely to show better results in the summer than in the winter. Prof. Henry M. Howe made a few remarks supporting Mr. Johnson, who, he said, had presented a logical and competent explanation of the economical features of the Gayley process.

Steel Production in 1906

The total production of steel in the United States, as reported by the American Iron and Steel Association, has been for two years past as follows:

	1905.		1906.	
	Tons.	Per Ct.	Tons.	Per Ct.
Bessemer	10,941,375	54.6	12,275,253	52.5
Open-hearth	8,971,376	44.8	10,970,998	47.0
Crucible, etc.	111,196	0.6	118,500	0.5
Total	20,023,947	100.0	23,364,751	100.0

The increase in bessemer steel was 1,333,878 tons, or 12.2 per cent.; in open-hearth, 1,999,622 tons, or 22.2 per cent.; in crucible and special steels, 7304 tons, or 6.6 per cent.; the total gain being 3,340,804 tons, or 16.7 per cent. The ratio of steel to pig iron was 92.3 last year. The division of the steel into acid and basic in 1906 was as follows:

	Acid.	Basic.	Total.
Bessemer	12,275,253	.....	12,275,253
Open-hearth	1,321,613	9,649,385	10,970,998
Crucible, etc	118,500	.....	118,500
Total	13,715,366	9,649,385	23,364,751

The basic metal was 88 per cent. of the open-hearth steel, and 41.3 per cent. of the total steel production. All the basic steel was made in the open-hearth furnace; the basic converter, so much used in Germany, and to a lesser extent in England, is not used in this country.

The year shows once more the rapid advance of the open-hearth, and especially the basic open-hearth process. The main part of the increase in 1906 was in basic steel, and the tendency to the use of the basic process gives every sign of advance. The proportion of open-hearth steel to the total production, which was 12.2 per cent. in 1890, increased to 19 in 1895; to 33.7 in 1900; to 44.8 in 1905, and to 47 in 1906; in a short time the open-hearth output will exceed the bessemer.

The geographical distribution of the steel production in 1906, disregarding the small quantity of crucible steel, was as follows:

	Bessemer.	Open-hearth.	Total.
Pennsylvania	4,826,725	7,710,949	12,537,674
Ohio	3,769,913	816,483	4,586,396
Illinois	1,685,056	884,472	2,569,528
Other States	1,993,559	1,559,094	3,552,653
Total	12,275,253	10,970,998	23,246,251

Pennsylvania made last year 53.9 per cent. of the total steel; Ohio, 19.7; Illinois, 11.1; the other States, 15.3 per cent.

It is of interest here to compare the steel output of the three more important producing nations for 1906, classed according to processes of manufacture. The output of the United States and Great Britain is in long tons; of Germany in metric tons:

	U. S.	Germ'y.	G.Brit'n.
Acid converter	12,275,253	407,688	1,307,149
Basic converter	.....	6,772,804	600,189
Total converter	12,275,253	7,180,492	1,907,338
Acid open-hearth	1,321,613	230,668	3,378,691
Basic open-hearth	9,649,385	3,534,612	1,176,245
Total open-hearth	10,970,998	3,765,280	4,554,936
Crucible and special	118,500	189,313	.....
Total	23,364,751	11,135,085	6,462,274
Proportion steel to pig iron	92.3	89.2	63.7

The production of the United States exceeded by 5,567,392 tons that of its two chief competitors combined. Putting the table in a different form, we have the following statement as to the respective makes of acid and basic steel:

	Acid.		Basic.	
	Tons.	Per Ct.	Tons.	Per Ct.
United States	13,715,366	58.7	9,649,385	41.3
Germany	715,952	6.4	10,419,133	93.6
Great Britain	4,685,840	72.5	1,776,434	27.5
Total	19,117,158	46.7	21,844,952	53.3

The make of basic steel was in excess of that of acid; a result chiefly due to Germany with its great supplies of ore suitable for making basic pig iron.

Mineral Production of Germany

The preliminary statement of the mineral production of Germany, as given by *Gluckauf*, from official data, gives the production of coal as below, in metric tons:

	1905.	1906.	Changes.
Coal	121,298,607	137,117,926	I. 15,819,319
Brown coal	52,512,062	56,415,333	I. 3,903,271
Total	173,810,669	193,533,259	I. 19,722,590

The increase in coal was 13 per cent.; in brown coal, or lignite, 7.4 per cent.

The output of other non-metallic minerals was as follows, also in metric tons:

	1905.	1906.	Changes.
Graphite	4,921	4,055	D. 866
Asphalt	103,006	117,413	I. 14,407
Petroleum	78,869	81,419	I. 2,550
Rock-salt	1,165,495	1,235,030	I. 69,535
Kainit	2,387,643	2,679,264	I. 291,621
Other potash salts	2,655,845	2,803,732	I. 147,887
Kieserit, etc	706	7,356	I. 6,650
Boracite	183	161	D. 22

A remarkable increase is here shown, in everything except two products of small importance.

The production of various salts, in their marketable forms, was as follows:

	1905.	1906.	Changes.
Salt	612,062	632,922	I. 20,860
Potassium chloride	373,177	403,387	I. 30,210
Magnesium chloride	29,017	38,468	I. 9,451
Glauber salts	68,455	81,175	I. 12,720
Potassium sulphate	47,994	54,490	I. 6,496
Pot.-mag. sulphate	34,222	34,239	I. 17
Magnesium sulphate	58,568	43,013	D. 15,555
Aluminum sulphate	52,892	55,969	I. 3,077
Alum	4,127	4,494	I. 367

Here also increases are shown in all except one item; some of the gains being considerable in quantity.

The output of various ores is reported as follows, in metric tons:

	1905.	1906.	Changes.
Gold & silver ore	10,286	8,066	D. 2,220
Copper ore	793,488	768,523	D. 24,965
Lead ore	152,725	140,914	D. 11,811
Zinc ore	731,271	704,596	D. 26,675
Iron ore	23,444,073	26,734,560	I. 3,290,487
Manganese ore	51,463	52,485	I. 1,022
Arsenic ore	4,913	6,259	I. 1,346
Pyrites	185,368	196,571	I. 11,203
Alum ore	636	1,120	I. 484
Miscel'neous ores	11,017	8,044	D. 2,973

Here there were decreases in several important items, such as copper, lead and zinc ores.

The production of metals other than iron is reported below, gold and silver being in kilograms:

	1905.	1906.	Changes.
Gold, kg	3,933	4,202	I. 269
Silver, kg	399,775	393,442	D. 6,333
Copper, tons	33,352	33,032	D. 320
Tin, tons	6,044	7,134	I. 1,090
Lead, tons	156,376	154,878	D. 1,498
Zinc, tons	198,208	205,691	I. 7,483

Metals from imported ores are included. The copper for 1906 includes 32,275 tons refined copper; 193 tons black copper, and 564 tons in copper matte. The lead in 1906 includes 4137 tons litharge.

There were made as by-products in the metallurgical work the following materials, the quantities being in metric tons:

	1905.	1906.	Changes.
Arsenic	2,535	3,052	I. 517
Sulphur	205	178	D. 27
Sulphuric acid	1,228,211	1,305,065	I. 76,854
Copperas	12,949	13,376	I. 427
Copper sulphate	6,988	6,757	D. 231
Mixed sulphates	159	158	D. 1
Zinc sulphate	5,896	6,092	I. 196
Nickel sulphate	220	187	D. 33
Metallic pigments	3,910	4,363	I. 453
Miscellaneous	6,139	6,764	I. 625

The sulphuric acid reported last year included 1,184,438 tons ordinary acid, and 120,627 tons concentrated acid.

The iron production for the year is reported as follows:

	1905.	1906.	Changes.
Foundry iron	1,797,680	2,003,883	I. 206,203
Direct castings	61,320	60,027	D. 1,297
Pessemer pig	410,963	491,086	I. 80,123
Basic pig	7,032,322	8,039,808	I. 1,007,486
Steel pig	580,344	755,678	I. 175,334
Forge iron	976,986	929,122	D. 47,864
Scrap and cinder pig	15,446	14,221	D. 1,225
Total	10,875,061	12,293,825	I. 1,418,764

The iron figures differ slightly from those reported by the German Iron and Steel Union, compiled from the monthly blast-furnace returns. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

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Illustrated.

The Market for Copper

The deadlock between the producers and consumers of copper continues. Some of the producers are willing and anxious to sell, but comparatively few of the consumers manifest any inclination to buy, even at the concessions in price which are offered. On the other hand, the United Metals Selling Company, and other interests of the same opinion, are ostensibly holding firmly at the asked price, 25c. per lb. for electrolytic, and display no inclination to sell at anything below that, but who knows at what figure business might be done if it were really offered? In the meanwhile the market is established by sales which are actually made, together with bona fide offerings. The dispute respecting the price of copper, which is exciting the portion of the press that has stock-market affiliations, and is mystifying the daily papers, depends entirely upon the point whether the price of copper is the asking price for metal that is not sold, or is the price actually received for metal that is sold. Our view, now as always, is the latter, and our quotations of the market are based on that view.

Our readers who have memories going back five or six years will recollect that there was a similar controversy in 1901, when the United Metals Selling Company was endeavoring to sustain the price of copper around 18c. Other interests took the business at lower prices, while the United Metals Selling Company accumulated stocks. Toward the end of the year the load became too great, and on Dec. 13 the price was cut to 15⅛c., followed by another cut on the 18th to 13⅞c., and on the 19th to 12⅞c. At present, the situation is not a parallel one (except in so far as the controversy as to the price is concerned), there being no such large accumulation of stock as there was in 1901. As we have previously pointed out, the situation appears to be more closely analogous to that of January and February, 1906. However, the conditions are in many respects different from those which prevailed at the latter time. It is not pessimistic to say that there is now more uncertainty as to the future than there was then.

The statistical position of copper is still apparently strong. During the first quarter of this year there was probably no increase in production. On the other hand, the exports decreased, leaving more copper available for domestic consumption. It is highly doubtful if there were any increase in the consumption during the first quarter of the year. The increase in 1906 was greatly exaggerated. Instead of the 20 per cent. increase, which was commonly talked about, the actual consumption, about 660,000,000 lb., showed a gain of only about 7.7 per cent. over 1905. However, the production in North America having shown an increase of less than 5 per cent., and the year having begun without any stock to speak of, a great increase in price was inevitable, although as in all cases where calm judgment is left behind, the anxiety of the consumers to cover their requirements caused them to bid up the market against each other, which policy was naturally fostered by the producers, always desirous to obtain the maximum possible for their output. As we remarked at the time, if consumers had followed a more conservative policy, they probably would have had no great difficulty in meeting their requirements. This became manifest a month or two ago, when the withdrawal of consumers from the market immediately caused the premium for early deliveries to disappear.

The present waiting attitude on the part of the consumers is easily understandable. There has been a little contraction in activity, and some cancelation of orders, but the governing factor is the awakening to the realization that industrial conditions in general during the last year have developed too high a degree of tension. The price for copper and for other commodities is intimately connected with the financial situation. The producer of copper demands and receives cash on delivery, or at the most grants only 30 days' credit, but the manufacturer is obliged to give long credits, and take many commercial chances. The difference between 25c. and 15c. copper, on the domestic consumption of 1906, means $66,000,000. The enhanced prices for lead, spelter, pig iron, and other commodities swell enormously the load which is put upon the consumers, who have to pay these premiums, and the tax upon our financial resources. As an important consumer of copper has stated recently, in the present temper of the market consumers hesitate to buy heavily for future delivery, and are waiting for stronger incentives before placing further orders. Consuming requirements will have to be more urgent than at pre-

ent before buyers will be tempted to pay the prices now quoted for distant futures. It is not a time for manufacturers to add heavily to their stocks, unless they are compelled to. If the recent unprecedented industrial demand of the country should slacken, it would be reasonable to expect that the market for raw materials generally will find a more normal and consequently a more healthy level. An extremely high price carries along with it a danger to legitimate trade, especially to consumers with their thousands of customers, to whom inflated and extended credits are unavoidable when accepting long-time orders based on prices now current.

It is unquestionable that we shall be obliged, sooner or later, to come down to a more reasonable level. The hands of the clock do not remain at 12 all the time. The difficulty will be to go down the hill without accident; recent occurrences have shown what is to be feared.

As to the immediate future, everything depends upon the consumers. Their requirements are not provided for beyond June, except in occasional instances. We have now reached the end of April, and they have been absent from the market for nearly two months. Provision for large requirements cannot generally be left until the last minute. Producers are obliged to have considerable time to meet specifications. Consequently, there is likely to be an appearance of consumers in the market during the coming month. The opinion that is then developed will decide the near future. We look for an upward reaction as the result of the buying that will then take place, but after that the trend is likely to be downward.

Again the Debris Question in California

The recent floods in California, which caused great damage, especially at those points where the rivers reach the flat lands of the State, have again aroused antagonism between the men of the mountains and those of the valleys, and the people along the Feather and Sacramento rivers are making protests against the continuance of dredge mining. It seems that the damage by the floods is charged to the dredges. At Oroville, the main seat of dredge mining, all the dredges are at work below the town, and none above it, and the flood waters naturally came from above. The charge is that the cobble-stone piles of tailings below the town held back the water, yet the fact is that the first flood waters came in at the upper end of the town.

The farmers in the valley insist that the streams are being filled with dredge tailings, causing their lands to be flooded, and seem determined to stop dredge mining altogether if they can. The fact is, however, that only two dredges are working in the river proper, the rest being operated at points some distance from the river. They are all landlocked and throw the tailings behind them in the pit in which the dredge floats. Nothing is put there that was not there before they began digging. The dredge men deny positively that their operations had anything whatever to do with the floods, or the damage resulting therefrom, and of course any unprejudiced, rational observation will support their contention.

However, the Sutter County Chamber of Commerce has taken the matter up officially and intends to make the dredgemen comply with the law—whatever that may mean. The dredgers are breaking no laws of any kind, and are honestly and usefully contributing to the welfare of the State, but the valley people are prejudiced against mining in every way and seem determined to make trouble. It is a pity that there cannot be an end to this bickering. Naturally the dredgers do not, however, intend to abandon their profitable industry unless forced to do so, and there will be a merry fight if the Anti-Débris Association attempts any of its usual high-handed proceedings.

Labor Troubles in California

There are decided signs of unrest among the miners in some of the Mother Lode counties of California, which are causing some alarm among the mine-owners. Already at Angels, the principal mining center of Calaveras county, the miners of the Utica, Lightner, North Star, and other large mines have made a formal demand for an eight-hour day, with the same wages as at present for 10 hours. Similar steps are about to be taken at some points in Tuolumne county. As these Mother Lode mines are all low-grade and have been working of late on narrow margins of profit, it is probable that if the miners insist in this change from the present conditions, some of the mines will have to shut down. These mines can be worked at a profit only when they have extensive reduction plants, as in fact most of them have, for the grade of ore is only about $2 to $3 per ton, and even less. It does not pay to work them when only small amounts of ore can be treated daily.

One of the largest mines in Tuolumne county, employing 250 men, has, as an average result of milling its ores, only $1.80 gross per ton. It is evident that in such cases the margin of profit is so small that a reduction in working hours or an increase in wages may compel the owners to quit mining entirely. Nearly the same conditions exist at Angels, where about 500 miners are employed. However, many of the miners are indifferent to this situation, since there is plenty of work for them elsewhere. The migratory Italians and other foreigners are supposed to be responsible for the new demands, which will surely be detrimental to the large number of miners who have their families and homes at these Mother Lode camps, and are permanent residents.

An Epoch in the Transvaal

The final abandonment of the first of the outcrop mines in the Witwatersrand is an event worth noting. The exhausted mine is the Bonanza, which is on the central part of the outcrop and has the Langlaagte and Crown Reef on one side, the Robinson and Ferreira on the other. It is perhaps the smallest property on the Rand, covering only about 10 acres, but as a compensation the ore was of higher grade than in most of the mines, the ore running about $17 per ton. For the last year operations have been confined to clearing out such ore as was left, and by this time the work will have been completed. As it is, the roofs are falling in and the shafts are getting out of shape. Since the commencement, gold to the value of $12,500,000 has been won by the owners, and during the war the Boer government extracted gold estimated at $1,200,000. Dividends amounting to $6,625,000 have been distributed, which is a good record. The nominal capital of the company was $1,000,000, of which $375,000 was working capital, and about $1,400,000 was spent out of income, in developing the mine and providing new plant. The exhaustion of the Bonanza marks an epoch in the history of the Transvaal.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Magnetic Iron Oxide in Copper-matte Smelting

My attention has been called to an article on magnetic oxide of iron in smelting in the JOURNAL of February 2. I have had a little experience with magnetite as a flux, and what I have to say may be of interest to your correspondent, D. B. N.

Some time ago I had a problem somewhat similar to his. The conditions were as follows: Given an ore and fluxes having the following composition, can a proper smelting mixture be made from them? The ore, oxidized, contained approximately: SiO_2, 75 to 80 per cent.; FeO, 3 to 4 per cent.; Pb, 1 to 1½ per cent.; Zn, 1 to 2 per cent.; Cu, 0.5 to 2 per cent.; CaO, 3 to 4 per cent.; MgO, 1 to 2 per cent.; Ag, 30 to 40 oz. The ore also contained from 1 to 2 per cent. sulphur and less than 1 per cent. of antimony. The limestone contained not more than 5 per cent. silica, and 5 to 10 per cent. magnesia. The iron ore was a very pure magnetite containing about 60 per cent. iron, 5 per cent. silica. The sulphide material in the charge was a matte containing about 30 per cent. copper.

My answer was that these ingredients could be combined into a satisfactory mixture. I then began experimenting with small crucible charges, and the results obtained were so satisfactory that it was decided to continue the tests on a larger scale. A lot of 150 tons of the ore was, therefore, sent here to be smelted.

MANNER OF CONDUCTING THE TEST

The only furnace available was a copper-matting furnace 44x140 in. at the tuyeres, and 12 ft. from tuyeres to feed floor. This was too large for the quantity of ore on hand, and too low for proper reducing action. It was, therefore, lined inside with fire brick, making it 36x100 in. at the tuyeres, and its hight was increased about 5 ft. by closing up the feed opening and cutting a new one higher up in the brickwork. The magnetite available for this test was not of as good quality as that at the mine. It contained 30 per cent. silicate of magnesia, a rather unpromising flux one would say.

As matte was the only sulphur compound, and to be had only in limited quantity, it was necessary to be as saving of it as possible, so, of course, no oxidizing action was allowable, and the reduction must be only sufficient to change the Fe_3O_4 into FeO. With an ore so silicious it was necessary to flux as much of the silica as possible, so it was decided to make as nearly as possible a bisilicate slag.

The test was begun with a slag of about 45 per cent. SiO_2, and 15 per cent. Fe, and the amount of matte added was about 6 per cent. of the charge. The furnace was run with a top so cold that the hand could be placed on the charge without discomfort. When the slag began to flow freely the charge was gradually changed so that finally the slag contained 47 to 49 per cent. SiO_2, and 12 to 15 per cent. Fe, the balance being principally lime and magnesia, the latter about 5 per cent. The amount of matte added was reduced to a little less than 5 per cent. of the charge. The coke was 14 per cent., and it could have been still further reduced if more ore had been on hand to continue the test.

The slag ran hot and fluid and was low in copper and silver, the copper being 0.3 per cent., and the average silver contents 0.86 oz. The matte was hot and liquid, and contained 30 to 35 per cent. copper, and 250 to 400 oz. silver. It went through the furnace with little change, except for the increased amount of silver. The blast pressure to start with was about 16 oz., and was raised toward the last of the run to 32 oz. The amount of magnetite used was from 300 to 400 lb. to the charge, weighing, exclusive of coke, about 2200 lb.

RESULTS OF THE EXPERIMENT

The run lasted four days and in all somewhat more than 300 tons of charge was smelted. Running a furnace in this way was altogether new to all of the men, except one, who said to me, "Why, you want it run just like a lead furnace." "Yes," I said, "that is the idea exactly." Smelting under such conditions is more like lead smelting than copper matting as the latter is usually carried on.

When the furnace was put out of blast it was found perfectly clean with no accretions of any kind. Theoretically, magnetite should reduce more easily than hematite, for in reducing to metallic iron it absorbs 1169 calories per kg. while hematite takes 1221 calories per kg. When in the course of reduction either from Fe_3O_4 or Fe_2O_3, FeO is formed, it is exactly the same thing chemically, and consequently must act in the same way. Because Fe_3O_4 is found in matte or slag it does not necessarily follow that it is simply unreduced ore or flux that has become mechanically mixed in it. It is just as likely to come from the partial reduction of Fe_2O_3 or perhaps the oxidation of FeO or FeS.

Hoffman, in his very interesting paper on the fusing points of slags, speaks of many slags being magnetic although no magnetite was used in his experiments. I am inclined to think that most, or all, of the supposed trouble with magnetite when used as a flux is more a cry of "wolf" than any real difficulty. In the test as made by me there was a larger excess of free silica, and in this it differed from the case of D. B. N., but otherwise they appear much the same. I think he will have little trouble if he has his ore column high enough and keeps the action of his furnace slightly reducing. As I have already said, run it more like a lead than a copper furnace.

MAGNESIA IN SLAGS

Another bugaboo that has frightened many metallurgists is magnesia, whereas up to a certain amount it is really beneficial, for it lowers the melting point, and weight for weight fluxes more silica than either lime or iron. Some time ago I made a number of experiments to test this point for bisilicate lime slags and found that up to a certain percentage magnesia lowered the melting point. I am writing from memory, my notes not being available; but as I remember it, the limit was about 10 per cent. The analysis and melting point of one slag may be of interest. The determination was made in duplicate and the temperature measured with a Le Chatelier pyrometer. The slag contained 52.6 per cent. SiO_2, 4.54 per cent. FeO, 37.4 per cent. CaO, and 5.36 per cent. MgO. Its melting point was found to be 1250 deg. C.; at 1300 deg. it was entirely fluid.

For a slag containing 50.63 per cent. SiO_2, 9.37 per cent. FeO and 40 per cent. CaO, Professor Hoffman[1] found the melting point to be 1430 deg. C., using Seger cones to measure the temperature.

J. S. C. WELLS.

Butte, Mont., April 10, 1907.

Copper Mines in Colorado

Colorado with its diversified mineral output, and standing at the head of the list in the United States in gold production, never has figured largely as a copper producer. The production of copper is, however, slowly increasing; according to the latest reports the production for 1906 was about 9,500,000 lb., produced

[1] "Temperatures at Which Certain Silicates Are Formed." *Trans.* A. I. M. E.

as a by-product of complex ores reduced by smelting in the custom smelting plants throughout the State. Colorado is not like her neighboring western States and Territories, where enormous capital is being invested in the development of large copper deposits.

The question has been asked whether there are districts yet undiscovered and undeveloped in Colorado, where conditions exist favorable for copper deposits. Having been interested in 1900 in the revival of the New-Old Nevada and its development, and having traversed and studied the ore-bearing deposits of Utah, Nevada, Arizona and other States of the great inter-mountain region, chiefly the copper mines, I have noted the peculiarities of some of the deposits in the monzonites and also some of the related contact fissures between the Plutonic and sedimentary rocks.

Deposits of the Great Basin

The great basin or inter-mountain area of Montana, Idaho, Utah, Nevada and Arizona, situated between the main Cordilleras to the east and the Sierra Nevada range to the west, evidently is the location of our most extensive copper deposits. The magnitude of some of these ore-bearing shoots and zones must be seen and studied to be appreciated.

There is nothing so far discovered in Colorado similar to these deposits, excepting the extensive mineral-bearing area of Leadville. Although different districts have their peculiarities, there is a certain parallelism between Leadville and some of the copper districts of Utah, Nevada and Arizona, and that is in the large area of Plutonic rocks and limestones and the mineralization adjacent to the contacts of the two rock series and the extension of the ore measures out and into the different rocks.

From recent discoveries in Leadville in some of the deep mining operations of that district, one may be led to believe that at no great distant date the unchanged as well as some of the re-enriched ore-bearing zones of this district will be found to contain bodies of copper ores commensurate in size with some of the bonanza copper deposits of the inter-mountain region.

The pumping problem at Leadville has been such as to prohibit private persons generally from exploring the copper areas, but in the hands of large corporations, with unlimited capital, the venture of opening up the deeper orebodies will result in great profit.

Other Deposits

The only other copper district so far discovered in Colorado is a limited area in the Red Mountain camp in the San Juan country, where the ore occurs in pipes and shoots of limited size, and can only be depended upon for small quantities, although in the Silverton district some of its large fissures have a considerable by-product of copper, but relatively small compared to the other metals produced. There is an undeveloped country north of the Moffat road and north of Middle Park, immediately west of the main Cordilleras, that promises some copper mines.

In speaking of copper mines I refer to ore masses of 50 ft. and upward in width of profitable ore; a deposit 10 or 12 ft. wide is a small producer. Only where great periods of solfataric action and other agencies have caused enormous depositions and replacements, are the "Big Fellows" among copper mines to be found. Colorado with the exception of Leadville, so far as discovered, does not show any such areas, but in its mineral production is the Mecca of the small mining corporations and not a field for consolidations.

In Colorado the largest production of a single mine is about 500 tons daily, while copper mines in Utah and Arizona will produce from 1500 to 5000 tons per day without effort.

J. A. Snedaker.

Denver, Colo., April 10, 1907.

Beginners

Most of us remember the time when we were inclined to be a little "fresh" and thought we "knew it all," consequently we should be somewhat tolerant of the young beginner and his self-opinionated ways, providing, of course, that this does not entail any loss or suffering on ourselves or others.

Fortunate is he, who, when leaving school or college, possesses a "silent tongue"; it will save him many a set-back and at the same time will be no hindrance to his advancement.

There is scarcely one of us who cannot recall a few bad breaks in speech and action, some to our shame and others to our sorrow. "Fools rush in where angels fear to tread" is a saying the young enthusiast might lay well to heart, especially one who intends entering the mining or metallurgical profession. The habit, too, of "roasting" is one that a beginner should discard immediately he commences business life. What he received and gave among his college association is not called for at his work; nor will he find respect for age and obedience to superiors at all derogatory to his manhood. Mining engineer, metallurgist, assayer or chemist, though not literally synonymous with *gentleman* does, judged from an educational point of view, imply such.

Some years ago it was the custom in Mexico for government inspectors to watch sampling personally, for taxation purposes, at ore-buying agencies. Following his usual practice an inspector on one occasion presented himself at a particular agency to which a young assayer had just been appointed. Not knowing Spanish the latter waited until his chief arrived, whereupon he blurted out: "Say! K——, what the —— is this —— greaser doing, poking his nose into everything?" Before the manager could reply the inspector, in excellent English, said: "Excuse me, Mr. K——, I shall be glad if you will give me the sample of the lot just finished." Needless to say this was a sufficient lesson to the beginner.

One youthful aspirant to managerial honors, a nephew of a director, was sent as assistant to a superintendent. A week after his arrival, seeing how smoothly everything was running, but not knowing that it was due to twenty years of hard experience of the man in charge, wrote to headquarters that the services of two men were superfluous, and that he could easily manage the whole business himself. The answer to this was a letter to the superintendent instructing him to place the assistant as timekeeper, and afterward as shift boss, where, no doubt, his abilities would prove more useful to the company than in his present capacity. It is to the credit of this beginner that he has since freely acknowledged the wisdom of that procedure.

Let the beginner understand that however well equipped he may be theoretically, other men have his knowledge plus several years' practical experience, to say nothing of riper judgment and, while one does not demand "old heads on young shoulders" one expects that youthful ignorance should give all due consideration to experienced age.

Walter Davis.

Sierra Mojada, Mex., April 4, 1907.

Current Density

Mr. Tommasi's remarks, on page 652 of the Journal of April 6, rather surprised me. Among electrical engineers there is no uncertainty whatever as to the meaning of "current density." Divide the current by the cross-sectional area of the path through which it "flows" and the quotient will be the current density. In referring to the current density at the face of an electrode, the same reasoning applies. If current passes to or from both faces, then the combined surfaces should be used as the divisor.

Cecil P. Poole.

New York, April 5, 1907.

According to a Japanese report, published in *La Nature*, Jan. 5, 1907, the production of gold in Korea in 1905 was 3430 kg., valued at 11,250,000 francs, all of which was of alluvial origin. The chief placer workings are in Hpyengan-To. The figures are based on customs statistics, and are probably much below the actual.

New Publications

LORD KELVIN'S VIEWS ON THE ADVANTAGES OF THE METRIC SYSTEM, WITH OPINIONS OF SEVERAL EMINENT MEN, ALSO EXPLANATORY TABLES. Pp. 64, 5½x8 in.; paper, 3d. London, 1906: Decimal Association.

THE GOLD SUPPLY AND PROSPERITY. Compiled and edited by Byron W. Holt. Pp. 264; 5x8 in.; cloth, $1; net. New York, 1907: The Moody Corporation.

In this volume are collected papers by several different financial authorities on the production of gold and its influence on industry, commerce and values. Mr. Holt has edited these contributions and has added an introduction and a concluding summary. The subject is one that has attracted the interest of financiers and economists; and it is, indeed, of great importance to all.

PRINCIPLES OF COPPER SMELTING. By Edward Dyer Peters. Pp. 612; illustrated, 6x9 in.; cloth, $5. New York, 1907; Hill Publishing Company.

This book is not a "revised and enlarged" edition of the author's "Modern Copper Smelting," the value of which successive editions have proved. Nor is it another work of the same kind, cast in the conventional form of a metallurgical text-book, and largely compiled from the literature of the subject. Without denying the necessity and usefulness of such works, I take the liberty of saying that this belongs to,—indeed, almost constitutes by itself—a higher class. It is a manual of methods of thinking, reasoning and generalizing in the field which it occupies. With the exception of two chapters (to be mentioned hereafter), the book contains practically no quotations; gives very few descriptions of plant or apparatus; avowedly omits, as far as possible, such details as can be obtained from other books (including the author's own); and presents, from beginning to end, his original work. It goes without saying, that such a book is much harder to write than one in which the author is little more than a critical compiler, employing the scissors more extensively than the pen.

Yet such a book is also more needed, just now, than a new sample of the old familiar type. In every department, whether of applied or theoretic science, there comes a time when students and practitioners are overloaded with the number and complexity of accumulated data; and someone must sift, classify and illuminate the mass of facts, placing them in true relation and perspective, and revealing the underlying principles which may have been obscured by a confusion of details.

But something more is required for the satisfaction of this need than the recognition of its existence. Superficial and imperfect generalizations are easy. An author may lay down a few "simple" laws, because he does not know enough to say more. Indeed, ignorance usually betakes itself to such dogmatism. It is a very different thing to deduce and state fundamental principles from a wide knowledge of fact and theory. In the particular field here under consideration, it may be said that he who would successfully discuss the principles of copper-smelting must have had practical experience of his own, must have known and critically weighed the experience of others, must have written a manual of practice, and must have acquired, through teaching, the art of clear and logical exposition. These conditions are fulfilled in extraordinary degree by Professor Peters; and his new book, consisting largely of his lectures at the Harvard school (carefully revised and considerably expanded, yet bearing the indelible stamp of the friendly instructor), will be a wonderful aid to all tutors and students of this subject. Indeed, the personal presence of the author is so vividly indicated in it that it might easily be used as an efficient guide to students not at school. Professor Peters seems to fear that in this respect, and for this reason, it will prove less interesting to trained practitioners. On the contrary, I think the latter will find the keenest pleasure in its clear summary of that which they know already, and its logical exposition of the reasons for many familiar rules.

Professor Peters's method and order are extremely simple and practical. In plain and largely non-technical words, he explains the first principles of smelting as a process of metallurgical concentration, with accessory changes of chemical condition. A chapter on the principles of roasting as a preparation for smelting follows, to be succeeded by one on the chemistry of copper-smelting, especially as involved in the mixture of charges. The practice of roasting, and that of matte-smelting in the blast furnace and the reverberatory respectively, are next discussed. At every step, the principles laid down are illustrated by calculations of progressive complexity, involving often not only metallurgical, but also economic conditions. For the author rightly considers the metallurgist's problem as wider than that of the laboratory chemist, because its solution must give a profitable, as well as a technically satisfactory, result. The operation cannot be called successful, if the patient dies.

Many will be likely to feel that the calculations here introduced are too numerous and repetitious, and too elaborately stated, even for such rudimentary reasoning. Thus pages 25 to 28 deal with the relation between the weight of a given ore mined and the weight of the same ore after roasting and before smelting—in other words, the relation between mine-capacity and adequate furnace-capacity. Assuming a simple ideal case, in which the metal R, with an atomic weight of 74.6, is mined as a sulphide (the ore containing 30 per cent. of sulphur), and roasted wholly to RO, the author explains at unnecessary length, that 74.6 lb. of R will unite with 16 lb. of oxygen; hence, 1 lb. R requires 0.2142 lb. O; 2000 lb. (one ton) R, 428.4 lb. O; and 700 tons $700 \times 428.4 = 299{,}880$ lb., or 149.94 tons O; hence, the total weight, after roasting, of 1000 tons RS mined will be $700 + 149.94 = 849.94$ tons. This is diffuse enough; but he goes on to show how the same result can be reached more directly by taking the ton instead of the pound as a unit. If 74.7 tons R require 16 tons O, then one ton requires, etc., and 700 tons require 700 × etc., to the same end. Moreover, there is another way: 74.7 tons R uniting with 16 tons O, give 90.7 tons RO. Hence, one ton R, etc.; hence 700 tons R, etc.; the final result being 849.94, as before. But there is yet another way: the weight of the oxygen gained in roasting may be subtracted from the weight of the sulphur lost, and the difference added to the original weight of ore. Again, this calculation may be shown in the form of a balance-sheet—gains of weight on one side, and losses on the other. Once more, since the atomic weight of O is exactly one-half that of sulphur, so that in roasting, the ore gains in oxygen half as much by weight as it lost in sulphur, the loss of 300 tons of sulphur will mean the gain of 150 tons of oxygen, and hence the weight after roasting of 1000 tons of ore mined will be $1000 - 300 + 150 = 850$ tons. And finally, "methods of solving this problem might be greatly multiplied!"

In a printed book, this seems to be simplicity somewhat overdone. Yet it is excess on the right side; and if the student will obey the author's injunction and wade patiently through all these synonymic variations, he will know the thing thoroughly at last. The skilled metallurgist will, of course, skip such elementary passages, formulas and demonstrations. For him, there is in the book an abundance of less diluted nourishment.

Chapter VIII, "Pyrite Smelting," Professor Peters declares to be based mainly upon the views and sugggestions of his friend, Robert C. Sticht, general manager of the Mt. Lyell Mining and Railway Company, Broken Hill, Australia. If I am not mistaken, Mr. Sticht has never published in English any such statement of his own.[1] Nor does any other English treatise (apart from monographs dealing with special cases and conditions) on this important subject deserve special notice—except, perhaps, "Fyrite Smelting," edited by Mr. Rickard and published by the ENGINEERING AND MINING JOURNAL in 1905. But that was not a coherent and logical treatise. It was a symposium, in

[1]His paper "Ueber das Wesen des Pyrit-Schmelzverfahrens," published last year in *Metallurgie*, has been freely used by Professor Peters.

which a score of metallurgists took part. It is safe to say, therefore, that Mr. Sticht's presentation, as arranged by Professor Peters, will take the first place in the technical literature of pyrite smelting.

Chapter IX, "A Practical Study of Slags," is an excellent example of Professor Peters' simple, patient and practical method. The reader who is studying the subject for the first time will be carried step by step to a knowledge adequate for ordinary problems. The reader already educated will perhaps be impatient of the slow progress of the argument; and one who consults the book casually must beware lest he accept as a general principle the result of a calculation based on assumptions avowedly not only arbitrary, but never occurring in practice. In a word, the book must be judged in the light of its primary purpose of progressive instruction; and, thus judged, it is admirable.

In connection with this chapter on slags, however, I venture to suggest one particular in respect of which it might be made still more useful. Namely, the daring, though not always scientific, experiments of American smelters led to the adoption, years ago, of certain empirical slags which had proved advantageous under given conditions. The adoption of such slags preceded, in fact, the recognition of their chemical formulas and their classification according to any general system. If Doctor Peters had added to his chapter on slags some instances of this character, giving the slags actually made and preferred at certain works for certain classes of ores, he would have furnished a valuable connection between theory and practice, enabling the student, on the one hand, to see how these traditional slags were explainable by the later scientific discussion; and, on the other hand, to know, in a given case, the nature of the slag which practice had already selected, and which theory also would approve. Without such an additional hint it is not impossible that a student of this chapter might find himself pretty completely instructed how to steer, but not clearly told what port he should steer for.

The succeeding chapters deal with "Matte," the "Production of Metallurgical Copper from Matte," and the "Principles of Furnace Building." The last, in particular, is an admirable example of summary statement.

Chapter XIV, on "Applications of Thermo-Chemistry," contributed by Prof. Joseph W. Richards, of Lehigh University, an acknowledged authority in this department, is an interesting, beautiful and valuable discussion of a most important element in metallurgical problems.

A chapter of miscellaneous and commercial facts and formulas concludes and an alphabetical index of 41 pages completes the book. I have spent many hours in reading it. It is as fascinating as a story. The reader who would reach the end sooner may "skip" now and then. But let him beware lest he thereby lose something necessary to a safe arrival. Rather than incur such a loss he had better suit his pace to that of Professor Peters, who never skips, but marches "unhasting, unresting" to his goal.

The Assay of Gold Bars

A. C. Claudet, Bull. No. 27 I. M. M., describes a method for the analysis of gold bars. The sample piece is flattened on an anvil with a hammer until thin enough to be cut with shears. The utmost cleanliness in this and all subsequent operations is observed. The weight taken for assay is 0.5 gram, 1000 millièmes. Triplicate portions of about 1001 millièmes are roughly weighed out. These portions are then carefully weighed by substitution weighing on a balance sensitive to 0.05 milliéme as follows:

The 1000 milliéme weight is placed on the right-hand pan of the balance and counterpoised with a rough weight on the left-hand pan and finally by means of the rider on the left-hand side of the beam an exact balance is obtained. The 1000 weight is removed and replaced with the assay piece which is carefully filed until it balances the counterpoise.

Every fourth or fifth assay piece is checked by another operator who has used the same 1000 weight in adjusting his balance. The piece is then wrapped in 4000 millièmes of lead with 35 millièmes of copper and 2500 of silver.

The cupellation is done in a Fletcher gas muffle furnace, cupelling 20 pieces at a time, including one check piece. The cupels are placed in five rows of four each in the center part of the muffle, surrounded by blank cupels and are baked for one hour before use. The check is placed in the eleventh cupel from the front row counting from left to right. Checks from different cupellations parted together seldom vary 0.1 millième, showing the fairly constant cupellation temperature maintained. The cupellation takes about eight minutes and the cupels are removed from the furnace while the metal is still molten, allowing the solidification to take place outside the furnace.

Parting

The buttons are removed from the cupels, squeezed, brushed and flattened with a hammer. They are annealed at a low red temperature and rolled into ribbons of equal length. The ribbons are reannealed and rolled into cornets, the rough side outermost, of the same number of convolutions. The cornets are parted, sixty at a time, in platinum trays. The first parting is in 25 oz. of 1.16 sp.gr. nitric acid and the boiling continues until the disappearance of the nitrous fumes. The tray is then removed, drained, washed with distilled water, drained and immersed in the second acid consisting of 25 oz. of 1.25 sp.gr. nitric acid, and boiled for twenty minutes. The tray is then removed, drained and immersed, without washing, in the third acid, which is of the same amount and strength as is the second, and boiled for twenty minutes. Again the tray is removed, drained, washed twice with distilled water, drained and dried over a gas burner covered with wire gauze and annealed in the muffle at a red heat until the cornets are of a bright gold color.

The cornets when cold are weighed on the same balance as originally weighed and in the same manner by adding small weights and the rider to the cornets until a balance is obtained. Check and assay pieces are checked by another operator. The surcharge varies from 0.7 to 1.0 milliéme.

All balances are examined by the balance maker once a month, as well as the weights and riders, and corrected if found faulty. The silver, lead and copper are tested to insure the absence of gold. The nitric acid is likewise tested for the absence of sulphuric and hydrochloric acids, and the solutions made up to exact srength.

Gold for Control Assay

Claudet's method of refining gold for use as checks consists of dissolving 12 oz. of cornet gold in aqua regia in two flasks and evaporating in porcelain dishes until chlorine commences to come off. The solution is then diluted to about 14 liters with distilled water, allowed to settle for three weeks and then siphoned off through a filter. A filtered solution of 2.25 lb. of oxalic acid is added and thoroughly stirred in and the gold allowed to settle for two or three weeks, and the solution is siphoned off as before. The gold is collected in a porcelain dish, washed by decantation with boiling distilled water, then with hydrochloric acid, water, and ammonia water in the order named.

Finally the gold is collected, dried and melted with niter in a clay crucible. The gold button is allowed to cool in the crucible, is then broken out, washed with water and hydrochloric acid and remelted in a plumbago crucible and cast in a small bar. The bar is washed, cleaned and rolled into a strip, which is cleaned before use.

Coal Production of the Transvaal in 1906

Owing to an error in the typewritten copy, the production of coal in the Transvaal for 1906 was given in the article on "Conditions met in South African Mines," by J. B. Pitchford, in the Journal of March 9, as 14,000,000 tons. The figures should have been "approximately 2,850,000 tons."

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States atent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALUMINUM NITRIDE. O. Serpek, Solothurn, Switzerland. Process for producing an aluminum nitride free from carbon by passing air over aluminum carbide. (Brit. No. 13,579 of 1906; March 9, 1907.)

CEMENT

CEMENT and Process of Manufacturing Same. Maximilian Toch, New York, N. Y. (U. S. No. 848,328; March 26, 1907.)

CEMENT KILN. John S. Wentz, Philadelphia, Pa. (U. S. No. 849,873; April 9, 1907.)

HYDRAULIC CEMENT—Process of Making Hydraulic Cement. Emil Mueller, Alsen, N. Y. (U. S. No. 850,778; Apr. 13, 1907.)

KILN. John A. Shumaker, Hyndman, Pa., assignor of one-third to George William Brinham and one-third to Norman Reuben Shumaker, Hyndman, Pa. (U. S. No. 850,066; April 9, 1907.)

CHROMIUM

FERRO-CHROMIUM. H. W. C. Annable and Ferro-Alloys Syndicate, London, England. A method of producing ferro-chromium free from carbon by smelting chromite over oxide of iron. (Brit. No. 5030 of 1906; March 9, 1907.)

COAL AND COKE

COAL BORING MACHINES. H. P. Moorley, Derby, England. Improvements in the upright frames used in supporting coal boring machines. (Brit. No. 13,649 of 1906; Apr. 6, 1907.)

BRIQUETS — Apparatus for Coking Briquets. Bernhard Wagner, Stettin, Germany. (U. S. No. 849,947; April 9, 1907.)

COAL CRUSHING STAMP. F. Meguin & Co., Dillingen, Germany. A pneumatic stamp for crushing coal. (Brit. No. 4923 of 1906; March 9, 1907.)

COAL CUTTERS. R. M. Percy, Wegan. In coal cutters using pronged percussive cutters, the arrangement of the prongs on sockets so that they can easily be renewed. (Brit No. 12,328 of 1906; March 23, 1907.)

COAL CUTTING MACHINES. R. Hay and H. G. Nadin, Burton-on-Trent. Improvements in the structure of coal-cutting machines in which cutting tools are carried on an endless chain to adapt it to use with an electromotor. (Brit. No. 9391 of 1906; March 16, 1907.)

COAL-CUTTING TOOL. G. W. Bonsfield, Wakefield, England. Improved coal cutting tool consisting of a cluster of removable points. (Brit. No. 11,646 of 1906. Mar. 30, 1907.)

COAL TIPPLE. John J. Fleming, Carrick, Pa., assignor to Phillips Mine and Mill Supply Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 849,113; April 2, 1907.)

COAL WASHING. P. Schondeling, Langendreer, Germany. In the feeding of coal to washers, the arrangement of nozzles whereby as much of the dust is extracted as possible before going to the washers. (Brit. No. 11,797 of 1906; March 23, 1907.)

COAL WASHING—Special Form of Scrapers for Use in Coal Washing Machines. Hardy Patent Pick Co., Sheffield, England. (Brit. No. 8037 of 1906; March 9, 1907.)

COAL-WASHING APPARATUS. Robert L. Martin, Jr., and Harvey Cory, Pittsburg, Pa., assignors to Pittsburgh Coal Washer Company, Pittsburg, Penn., a Corporation of Penn. (U. S. No. 850,594; Apr. 13, 1907.)

COKE—Apparatus for Separating and Discharging Coke. Walter Schumacher, Dusseldorf, Germany. (U. S. No. 849,429; April 9, 1907.)

DUST COLLECTOR. E. Dickinson and G. Smith, Sheffield, England. An apparatus for drawing off and collecting dust from coal. ores, etc. (Brit. No. 6910 of 1906; March 23, 1907.)

COPPER

COPPER CONVERTER LININGS. H. L. Charles and F. A. Heinze, Butte, Mont. Improved method of drying and hardening the linings of copper converters. (Brit. No. 16,322 of 1906. Mar. 30, 1907.)

CORUNDUM

CORUNDUM — Treatment of Corundum. Max Buchner, Mannheim-Waldhof, Germany. (U. S. No. 848,439; March 26, 1907.)

GLASS MANUFACTURE

GLASS FURNACE. Solon O. Richardson, Jr., Toledo, Ohio. (U. S. No. 849,021; April 2, 1907.)

GOLD AND SILVER

DREDGING—Scoop Bucket for Dredging Purposes. Charles Pay, Providence, R. I. (U. S. No. 850,096; April 9, 1907.)

FILTER PRESSES FOR SLIMES. C. Butters, London, England. A vacuum filter press for slimes, in which a solvent is drawn through the adhering cake of slimes so as to increase the total extraction. (Brit. No. 20,979 of 1906; Apr. 6, 1907.)

GOLD EXTRACTION. J. A. Just, Pulaski, New York. Dissolving gold and silver from ores by means of a mixture of nitrate of soda and acid, by means of which the oxygen set free oxidizes the metals which can then be taken up into solution. (Brit. No. 4796 of 1906, Mar. 30, 1907.)

GOLD WASHING and Saving Apparatus. George L. Holmes, Oakland, Cal. (U. S. No. 849,614; April 9, 1907.)

HYDRAULIC MINING—Gold-saving Apparatus. Erastus S. Bennett, New York, N. Y. (U. S. No. 849,101; April 2, 1907.)

METAL EXTRACTION—Apparatus for Extracting Metals from Their Ores. Craig R. Arnold, Philadelphia, Penn. (U. S. No. 849,097; April 2, 1907.)

ROCKER—Machine for Separating Gold and Platinum from Other Material. Charles O. Michaelsen, Salt Lake City, Utah. (U. S. No. 849,553; April 9, 1907.)

IRON AND STEEL

BASIC STEEL. F. Benjamin, Beuthen, Germany. In the basic steel process, where iron low in phosphorus is used, producing a slag rich in phosphorus by adding certain phosphorus compounds to the charge. (Brit. No. 1102 of 1906; March 23, 1907.)

OPEN-HEARTH STEEL FURNACES — Compound for Facing the Ports of Open-hearth Steel-furnaces. Addison H. Beale and Elwood F. McDowell, Pottsville, Penn. (U. S. No. 850,723; Apr. 13, 1907.)

REVERBERATORY FURNACES. M. Moore and T. J. Heskett, Melbourne, Australia. Improvements on reverberatory furnaces for producing wrought iron direct from ore, with the object of preventing the great loss of iron usual in this process. (Brit. No. 17,131 of 1906; March 16, 1907.)

ROLLING MILL. William H. Brown, Pittsburg, Penn. (U. S. No. 848,438; March 26, 1907.)

ROLLING MILL—Controller for Rolling Mill Repeaters. Frank P. Townsend, Elyria, O., assignor to National Tube Co., Pittsburg, Penn., a corporation of New Jersey. (U. S. No. 848,581; March 26, 1907.)

LEAD

WHITE-LEAD MANUFACTURE. Union Lead and Oil Company, New York, N. Y. Improvements in plant used for making white lead, in which comminuted lead is projected into corroding chambers. (Brit. No. 5015 of 1906; Apr. 6, 1907.)

PETROLEUM

OIL-WELL CLEANER. Fred N. Scofield, Kern, Cal. (U. S. No. 848,501; March 26, 1907.)

RARE METALS

FILAMENT for Incandescent Electric Lamp. Vereinigte Electricitäts Gesellschaft, Budapest. Improvement in the production of filaments for electric lamps, consisting of carbon cores with coatings of molybdenum or tungsten. (Brit. No. 4081 of 1906; March 16, 1907.)

FILAMENTS for Incandescent Electric Lamps. Consortium für Electrochemische Industrie, Nuremberg, Germany In preparing tungsten for electric filaments, keeping it at a temperature just under smelting point for some time in order to improve its electric properties. (Brit. No. 15,021 of 1906; March 23, 1907.)

TANTALUM. Siemens & Halske, Berlin, Germany. Process for producing homogeneous masses of tantalum. (Brit. No. 22,491 of 1906; Mar. 30, 1907.)

TANTALUM—Production of Homogeneous Bodies from Tantalum or Other Metals. Marcello von Pirani, Wilmersdof, Berlin, Germany, assignor to Siemens & Halske A.-G., Berlin, Germany, a corporation of Germany. (U. S. No. 848,600; March 26, 1907.)

TUNGSTEN FILAMENT for Incandescent Electric Lamps. Vereinigte Electricitäts Gesellschaft, Budapest. Improvements on tungsten filaments for electric lamps with the object of rendering them less brittle. (Brit. No. 3213 of 1906; March 16, 1907.)

ZINC

LITHOPONE. J. Ephraim, Berlin, Germany. In the manufacture of lithopone, i.e., the paint consisting of barium sulphate and sulphide of zinc, methods of treatment which will prevent the paint turning gray afterward. (Brit. No. 16,516 of 1906; March 9, 1907.)

MINING—GENERAL

MINING SIGNAL SYSTEM. Norman S. Richmond, Oshkosh, Wis. (U. S. No. 850,100; April 9, 1907.)

METALLURGY—GENERAL

ANTIMONY AND ARSENIC EXTRACTION. J. R. Masson, Melbourne, Australia. A variation of the process for recovering antimony and arsenic from ores by means of a solution of caustic alkali. (Brit. No. 13,012 of 1906; Apr. 6, 1907.)

BRIQUETS. A. Tavernier, Paris, France. An agglutinant for making briquets, consisting of the extract obtained by boiling wood in sulphurous acid solutions. (Brit. No. 24,742 of 1906; Apr. 6, 1907.)

BRIQUETS. R. Middleton, Leeds, England. Improved press for making briquets by extrusion. (Brit. No. 6249 of 1906; Apr. 6, 1907.)

BRIQUETTING. S. Suski, Kieff, Russia. In preparing fuel and other briquets, adding manganese dioxide or other oxidizing agent to the tar or other agglutinant used. (Brit. No. 13,355 of 1906; March 16, 1907.)

ELECTROLYSIS. P. Ferchland, Berlin, Germany. For electrolytic processes, such as the electrolysis of salt, the use, as an anode, of lead peroxide electrolytically deposited in compact form from solutions of lead salts. (Brit. No. 24,806 of 1906; March 9, 1907.)

ELECTROLYSIS—Process of Producing Light Metals by Electrolysis. Franz von Kügelgen and George O. Seward, Holcombs Rock, Va. (U. S. No. 850,376; Apr. 13, 1907.)

METAL. A. Bontempi, New York. The production of a metal consisting of a mixture of lead or antimony with hydride of iron. (Brit. No. 18,742 of 1906; Mar. 30, 1907.)

METAL EXTRACTION from Silicious Ores. A. Seigle, Lyons, France. A process for extracting metals from silicious ores by mixing them with chlorides and acting on the mixture by steam pressure, thus liberating chlorine, which dissolves out the metal. (Brit. No. 3575 of 1906; March 16, 1907.)

METALLIC OXIDES—Method of Manufacturing Metallic Oxides. John H. Montgomery, St. Louis, Mo., assignor of one-third to Francis H. Ludington and Frank Orff, St. Louis, Mo. (U. S. No. 849,555; April 9, 1907.)

METALLIC PEROXIDES. Kirchhoff and Neirath, Berlin, Germany. Making metallic peroxides by bringing the oxides in solution into contact with hydrogen peroxide freshly liberated from sodium peroxide. (Brit. No. 14,489 of 1906; March, 9, 1907.)

SOLDER. R. J. Crowley and F. F. Payne, London, England. A solder consisting of three parts of tin, one of lead and one of zinc, and a method of employing it. (Brit. Nos. 3310 and 3310a of 1906; March 9, 1907.)

MINING MACHINERY AND APPARATUS

ACETYLENE LAMPS. P. Best, Essen, Germany. Improvements in acetylene lamps used in mines, especially with the object of preventing irregularity in generation due to jolting. (Brit. No. 7531 of 1906; Mar. 30, 1907.)

AERIAL ROPEWAYS—Differential Clip for Aerial Ropeways, etc. Yusuke Tamamura, Ahio, Japan. (U. S. No. 850,504; Apr. 13, 1907.)

BLASTING—Miner's Fuse Tool. Charles Elliott, Scammon, Kas. (U. S. No. 847,923; March 19, 1907.)

BORING APPARATUS. G. Burnside, Durham. Improvements in the inventor's rock boring apparatus, especially useful in boring long holes in prospecting work. (Brit. No. 18,440 of 1906; Mar. 30, 1907.)

CONVEYER—Endless Conveyer. Francis A. M. Smulders, Rotterdam, Netherlands. (U. S. No. 850,684; Apr. 13, 1907.)

CONVEYER — Cross Conveyer. Chester Bradford, Indianapolis, Ind. (U. S. No. 849,594; April 9, 1907.)

CONVEYER. John T. Wilmore, Denver, Colo. (U. S. No. 849,345; April 2, 1907.)

CONVEYER—Apron Conveyer. Henry G. Ginaca, Honolulu, Hawaii. (U. S. No. 848,-236; March 26, 1907.)

CONVEYER BELT. Ernest A. Houchin and Anthony Huber, Brooklyn, N. Y. (U. S. No. 850,002; April 9, 1907.)

CONVEYER-CHAIN. Michael Garland, Bay City, Mich. (U. S. No. 850,149; Apr. 13, 1907.)

DEEP BORING APPARATUS—Deutscher Tiefbohr, A. G., Nordhausen, Germany. Improvement in the inventor's deep-boring apparatus, with the object of distributing the water more efficiently for cleaning the hole and bringing up the broken rock. (Brit. No. 20,538 of 1906; March 16, 1907.)

DRILL—Core Drill. Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn., a corporation of Pennsylvania. (U. S. No. 848,227; March 26, 1907.)

DRILLS—Scraper for Disk Drills. Edwin R. Beeman, Minneapolis, Minn., assignor to Monitor Drill Co., St. Louis Park, Minn., a corporation of Minnesota. (U. S. No. 849,187; April 2, 1907.)

DUMPING APPARATUS. Samuel W. Hopkins, Enterprise, Kans. (U. S. No. 850,648; Apr. 13, 1907.)

HOISTING — Safety Rope Clamp. John Collins, San Francisco, Cal. (U. S. No. 849,832; April 9, 1907.)

HOISTING APPARATUS. Lincoln Moss, New York, N. Y., assignor to Robins Conveying Belt Co., New York, N. Y., a corporation of New Jersey. (U. S. No. 849,257; April 2, 1907.)

HOISTING APPARATUS. Victor R. Browning, Nottingham, Ohio. (U. S. No. 848,287; March 26, 1907.)

HOISTING APPARATUS for Deep Wells. Walter S. Sutton, Kansas City, Kans. (U. S. No. 850,549; Apr. 13, 1907.)

HOISTING MACHINES—Brake for Hoisting Machines. Guy C. Grable, Minneapolis, Minn., assignor, by mesne assignments, to W. L. McBride, Minneapolis, Minn. (U. S. No. 850,152; Apr. 13, 1907.)

HOISTING MECHANISM. Geo. W. King, Marion, Ohio, assignor to the Marion Steam Shovel Co., Marion, O., a corporation of Ohio. (U. S. No. 849,625; April 9, 1907.)

MINE CARS—Check Lock for Mining Cars. Charles A. Cabell, Carbon, W. Va. (U. S. No. 848,441; March 26, 1907.)

MINE DOOR. William W. Zuber, Osnaburg, Ohio. (U. S. No. 848,716; April 2, 1907.)

MINING BY SUBLIMATION—Process of Extracting and Recovering the Volatilizable Contents of Sedimentary Mineral Strata. Delos R. Baker, Delaware, Ohio. (U. S. No. 849,524; April 9, 1907.)

MINING MACHINE. Edward G. Tillman, Thayer, W. Va. (U. S. No. 850,192; Apr. 13, 1907.)

MOTOR for Rock Drills and Similar Tools. Charles E. Shadall, Milwaukee, Wis., assignor of one-half to Frederick L. Horneffer, Milwaukee, Wis. (U. S. No. 849,578; April 9, 1907.)

PUMP. William Y. Cruikshank, Freeland, Penn., assignor of one-half to Nixon Maley, Freeland, Penn. (U. S. No. 847,735; March 19, 1907.)

RAILWAY — Underground Eectric Railway. Sylvester M. Sullivan, San Francisco, Cal. (U. S. No. 848,507; March 26, 1907.)

ROCK DRILL. Charles E. Shadall, Milwaukee, Wis., assignor of one-half to Frederick L. Horneffer, Milwaukee, Wis. (U. S. No. 849,506; April 9, 1907.)

ROCK DRILL. Frederick E. Glaze, Victor, Colo., assignor to Eureka Drill Steel Co., Cripple Creek, Colo., a corporation of Colorado. (U. S. No. 849,229; April 2, 1907.)

ROCK DRILL BITS. W. E. Kimber, Johannesburg. In bars of steel intended for the manufacture of rock-drill bits, using a bar composed of a core of the hardest steel with softer steel round it; as the drill is used, the outer parts wear down first and keep the point always sharp. (Brit. No. 8683 of 1906; March 23, 1907.)

ROCK-DRILLING-MACHINE CHUCK. Sigismund R. J. Maynard, Aldrovand V. T. Maynard and Frank Gale, Fordsburg, Transvaal. (U. S. No. 847,590; March 19, 1907.)

ROCK-DRILLING MACHINES—Means for Mounting Rock-drilling Machines or Engines. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 850,885; Apr. 13, 1907.)

ROCK DRILLS—Attachment for Supplying Water to Rock Drills. Eustace M: Weston, Johannesburg, Transvaal. (U. S. No. 849,445; April 9, 1907.)

TUNNELING APPARATUS. Frank A. Moffitt, Chicago, Ill. (U. S. No. 847,801; March 19, 1907.)

WELL-DRILLING MACHINE. John W. Scherer, Petersburg, Va., assignor of one-half to William A. Scherer, Petersburg, Va. (U. S. No. 849,271; April 2, 1907.)

WELL SINKING—Method of and Apparatus for Sinking Wells. Eugene F. Bradt, Detroit, Mich. (U. S. No. 849,043; April 2, 1907.)

ORE DRESSING MACHINERY

CLASSIFIER. Charles W. Merrill, Lead, S. D. (U. S. No. 849,153; April 2, 1907.)

CRUSHER—Gyratory Crusher. Oliver C. Redding, Chicago, Ill., assignor of one-half to William K. Kenly, Chicago, Ill. (U. S. No. 850,491; Apr. 13, 1907.)

CRUSHER—Rock and Ore Crusher. Geo. H. Thurston, Johannesburg, Transvaal, assignor to Allis-Chalmers Company, Milwaukee, Wis., a corporation of New Jersey. (U. S. No. 848,782; April 2, 1907.)

CRUSHING-MILL. Jean Morin, Dayton, Ohio. (U. S. No. 850,596; Apr. 13, 1907.)

CRUSHING MILL — Ore Crushing and Screening Mill. Joseph Algert, Denver, Colo. (U. S. No. 849,037; April 2, 1907.)

GRINDING and Pulverizing Apparatus. Bertram Hunt, San Francisco, Cal. (U. S. No. 849,545; April 9, 1907.)

GRINDING MILL—Pebble Mill. George S. Emerick, Nazareth, Penn. (U. S. No. 849,730; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,779; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,780; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,782; April 9, 1907.)

GRINDING MILLS—Metal Ring for Pulverizing or Grinding Mills. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,-781; April 9, 1907.)

MIDDLINGS PURIFIER. Geo. T. Smith, Minneapolis, Minn., assignor of three-fourths to Minneapolis Steel and Machinery Co., Minneapolis, Minn., a corporation. (U. S. No. 848,404; March 26, 1907.)

ORE CLASSIFIER. John Van N. Dorr, Lead, S. D. (U. S. No. 849,379; April 9, 1907.)

ORE-CONCENTRATING TABLE. Howard D. McLeod, Great Falls, Mont. (U. S. No. 850,391; Apr. 13, 1907.)

ORE SEPARATOR. John W. Gibson, Milwaukee, Wis. (U. S. No. 849,385; April 9, 1907.)

PULVERIZERS. J. W. Fuller, Catasauqua, Penn., U. S. A. In pulverizers having balls running in an annular grinding surface, an improved method of supporting the vertical rotary shaft. (Brit. No. 14,628 of 1906; March 23, 1907.)

SCREEN. Frank Mikesell, Jr., Fort Scott, Kans. (U. S. No. 849,154; April 2, 1907.)

SCREENING — Unloading, Screening and Loading Apparatus. John W. Seaver, Cleveland, O., and Alexander Leslie, Walkerville, Ontario, Canada, assignors to Wellman-Seaver-Morgan, Cleveland, O., a corporation of Ohio. (U. S. No. 849,920; April 9, 1907.)

SCREENS IN GRINDING MACHINES. J. W. Fuller, Catasauqua, Penn. Improved arrangement of screens in grinding machines having circular ball tracks. (Brit. No. 14,629 of 1906; March 16, 1907.)

MAGNETIC SEPARATION. The Humboldt Company, Cologne, and the Metallurgischegesellschaft, Frankfort, Germany. In magnetic separators, passing the ore along belts under series magnets of different power, which attract the various constituents up to belts traveling at right angles to the main belt. (Brit. No. 20,545 of 1906; March 23, 1907.)

MAGNETIC SEPARATOR. H. M. Sutton, London, England. A magnetic separator in which magnetic particles adhere to a portion of the surface of a revolving cylinder. (Brit. No. 2993 of 1906; March 9, 1907.)

PULVERIZER. Nickolas Spurgin, Ottawa, Ill., assignor of one-half to Benjamin B. Holland, Ottawa, Ill. (U. S. No. 848,213; March 26, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

CONVEYER for Metal Bars. Jerome R. George, Worcester, Mass., assignor to Morgan Construction Co., Worcester, Mass., a corporation of Massachusetts. (U. S. No. 849,122; April 2, 1907.)

DISTRIBUTING FAN. A. L. J. Queneau, South Bethlehem, Penn. A fan for distributing the charges of retorts, furnaces, etc. (Brit. No. 1101 of 1906; March 23, 1907.)

ELECTROLYTIC APPARATUS. Anson G. Betts, Troy, N. Y. (U. S. No. 850,127; Apr. 13, 1907.)

GAS PRODUCER. William R. Miller, Pittsburg, Penn., assignor to Foster Miller Engineering Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 848,118; March 26, 1907.)

GAS PRODUCER. William R. Miller, Pittsburg, Penn., assignor to Foster Miller Engineering Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 849,848; April 9, 1907.)

GAS PRODUCER—Process of Producing Gas. Henry L. Doherty, Madison, Wis. (U.S. No. 848,729; April 2, 1907.)

GAS PRODUCERS—Feed Mechanism for Gas-producers. Alonzo L. Parker, St. Joseph, Mo. (U. S. No. 850,395; Apr. 13, 1907.)

MELTING METALS—Device for Feeding Melting Pots. Eugene Trama, Marseilles, France. (U. S. No. 848,868; April 2, 1907.)

ORE ROASTING and Treating Apparatus. Myron Dings and Alvin Dings, Milwaukee, Wis. (U. S. No. 849,465; April 9, 1907.)

ORE-ROASTING APPARATUS. Robert McKnight, Philadelphia, Penn. (U. S. No. 850,-039; April 9, 1907.)

SAMPLING—Sample Mixer. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 849,-540; April 9, 1907.)

SKIMMING DEVICE for Molten Metals. George W. Moore, Burlington, N. J. (U. S. No. 848,840; April 2, 1907.)

VANNER. George O. Bradley, Salt Lake City, Utah. (U. S. No. 850,415; Apr. 13, 1907.)

FURNACES

CALCINING FURNACE. Thomas McNeal, Kansas City, Mo. (U. S. No. 850,041; April 9, 1907.)

CHARGING APPARATUS. Robins Conveying Belt Company, New York. A furnace charging apparatus, specially designed for smelting furnaces treating copper and lead ores. (Brit. No. 16,797 of 1906; Mar. 30, 1907.)

ELECTRIC INDUCTION FURNACE. Grönndal Kjellin Co. and J. Harden, London. In the inventors' electric induction furnace, making the windings of the primary coil of hollow conductors through which the cooling medium may be circulated. (Brit. No. 16,269 of 1906; March 23, 1907.)

ELECTRIC FURNACE IMPROVEMENTS. A. R. Lindblad and O. Stalhane, Ludvika, Sweden. In electric smelters of the transformer type, an improved method of arranging transformer core in order to reduce the magnetic leakage. (Brit. No. 23,379 of 1906; Apr. 6, 1907.)

ELECTRIC SMELTING FURNACES. A. Heorth, Christiania, Norway. Improvements in electric smelting furnaces. (Brit. Nos. 28,960, 28,961 of 1906; March 23, 1907.)

MELTING FURNACE. C. Twer, Urdingen, Germany. An improved melting furnace for melting iron, brass and other metals. (Brit. No. 14,779 of 1906; Mar. 30, 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. C. Burger, of New York City, has been examining properties in Nevada.

W. H. Robertson, of Webb City, Mo., is representing the Cockerill Zinc Company, in Mexico.

G. W. Miller, of Denver, is examining mines near Telluride, Colo., for a London syndicate.

W. H. Blackburn has been appointed superintendent for the Tonopah Mining Company, of Nevada.

C. W. Kempton returned last week to New York from a professional trip to Chile, South America.

C. A. Bohn, of Mexico City, is in Monterey, Mexico, on business for the National Metal Company.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, of Fernie, B. C., is in Toronto, Ontario.

A. A. Ireland, of Georgetown, Colo., has gone to Mexico to examine properties in the interests of Eastern parties.

Robert Linton, of R. M. Atwater & Co., has returned to Helena, Mont., from a business trip to Chicago and Pittsburg.

C. N. Brown, of Socorro, New Mexico, is making an extended trip through old Mexico in the interests of the Empire Zinc Company.

E. H. Hadley, manager of the property of the Butte-Montana Copper Company, has returned to Butte from a business trip to Pittsburg.

M. E. Wadsworth, dean of the department of mines and metallurgy of the Pennsylvania State College, has been visiting in New York.

Rees C. Vidler, a well known operator in the Argentine district, Clear Creek county, Colo., has returned from a business trip to London, England.

Victor Rakowsky, of Duluth, Minn., engineer for the Butte & Superior Copper Company, is visiting Butte, Mont., where the company's ground is located.

Freeman Thoman, of Georgetown, Colo., has left for the Cassiar, British Columbia, where he will take charge of copper properties for Denver owners.

Austin King, formerly superintendent of mines for the Dominion Coal Company, is suing the company for $85,000 for wrongful dismissal from that position.

H. Vincent Wallace has returned to Nogales, Arizona, from Guanajuato, Zacatecas and Durango, Mexico, where he has been engaged in professional work.

John C. Adams, superintendent of the Boston & Montana mines in Butte, is inspecting the property of the Butte & Arizona Copper Company near Bisbee, Arizona.

George Squire is on a vacation in the United States before taking up his duties as superintendent of the new plant of the American Smelting and Refining Company, at Chihuahua, Mexico.

George W. Maynard left New York April 20, for the purpose of examining mining properties in Nevada and the Yukon. His address until June 1 will be White Horse, Yukon territory.

B. B. Thayer, who represents H. H. Rogers, of New York, in the Amalgamated, is making his quarterly inspection of Amalgamated properties in Butte, having arrived there from the East.

Alexander Veitch has resigned as superintendent of the Arizona Copper Company, of Clifton, Ariz., to assume a similar position with the Arizona Amalgamated Copper Company, also of Clifton.

S. A. Knowles, superintendent of the Newhouse tunnel at Idaho Springs, Colo., has resigned his position to take one in an executive capacity with the Boston Consolidated Copper Company, at Bingham, Utah.

W. D. Thornton, vice-president of the Butte Coalition Company, and interested in several enterprises with Thomas F. Cole, of the lake country, has returned to Butte from a three months' sojourn in New York.

Dr. Alexander N. Winchell, of the Montana State School of Mines, has been elected to fill the chair of petrography and mineralogy, formerly held by Prof. William H. Hobbs, at the University of Wisconsin.

G. P. Grimsley, of the West Virginia Geological Survey, at Morgantown, W. Va., has been visiting New York. He will soon begin field-work for the season, on a general investigation of the iron ores of the State.

Frank Robbins is examining placer ground on the Colorado river and later in April he will make his usual visit of inspection to the niter lands in Inyo county, California, returning to Los Angeles in May.

H. R. Harrison, assistant superintendent at the American Smelting and Refining Company plant, Monterey, Mexico, has resigned, to take a similar position with the Peñoles Mining Company, at its smelter in Mapimi, Mexico.

John de Forest Junkin, Jr., of Coalgate, I. T., general manager of the Coalgate Company, has been very ill for the past six weeks at the residence of his wife's parents, in New York, with tonsilitis and rheumatism. He is improving.

George Hardy, of Carnegie, Penn., who has been for the past three months examining the zinc and lead-silver orebodies of the Gavilana mining district, near San Jose del Sitio, Chihuahua, Mexico, for Pittsburg capitalists, has returned home.

Horace V. Winchell, formerly chief geologist for the Amalgamted Copper Company, now occupying a similar position with the Great Northern Railroad Company, is in Butte, Mont., on business connected with his company's mining interests.

J. B. Cavanaugh, secretary of the Western Coal and Dock Company, of Chicago, recently spent several days in the Birmingham district, in Alabama. The company owns and operates mines in Alabama and will make further investments in the district.

Lucius Mayer, mining engineer with the American Smelters' Securities Company, has completed a trip through the various coalfields, where he has observed the different methods of flushing, robbing, and mine development, with reference to applying certain principles to properties of his company.

T. S. Lowther, superintendent of the Rochester & Pittsburg Coal and Iron Company mines, at Walston, Penn., has been appointed mine inspector for the Twentieth bituminous district by Governor Stuart. Adolph Cook, of Westmoreland county, is named for the inspectorship of the Nineteenth district.

Eli T. Connor, of Cresson, president of the board of arbitration in the Central Pennsylvania field has tendered his resignation in order to accept the position of general manager of the Jeddo Coal and Coke Company, of West Virginia. J. F. Somerville, of Clearfield, for many years with the Pennsylvania Coal Company, has been chosen as his successor.

Edward H. Coxe, of Hartshorne, I. T., superintendent of Indian Territory mines for the Rock Island Coal Company, has resigned, effective May 1, to accept the position of general superintendent of coal and coke properties of the Tennessee Coal, Iron and Railroad Company, and the Republic Iron and Steel Company, with headquarters in the Woodward building, Birmingham, Ala. This is a new position created by the separation of the coal from the other mines.

Obituary

James J. Ott, who died in Nevada City, Cal., April 1, aged 81 years, was born in Switzerland, but came to this country at an early age. He was a cousin of Col. John A. Sutter, and with him was one of the pioneers of California. After some mining experiences he settled in Nevada City, where he conducted an assay office for 51 years, and where he was well known and esteemed. It is said that in his office the assays were made which first revealed the silver values contained in the Comstock lode. Mr. Ott, at different times, owned several mines, among them the Lecompton on Deer creek, which later passed into possession of George Hearst.

Thomas Venners, a retired ironmaster,

who was at one time associated with Henry Bessemer, died in Brooklyn, N. Y., April 18. He was born near Birmingham, England, in 1823, and when a boy went to work in a rolling mill. In 1859 he was made superintendent of the Round Oak Iron Works, Brierly Hall, Staffordshire, England. Ten years later he came to America and erected a rolling mill at Portsmouth, Ohio. Later he took charge of the steel works of the Baltimore & Ohio Railroad at Cumberland, Md. He resigned in 1875 to become superintendent of the Keystone Mill at Pittsburg. Mr. Venner invented many improvements in iron and steel manufacture. He retired in 1892. He leaves two sons and four daughters.

Societies and Technical Schools

Mining Engineering Societies Joint Meeting—The mining engineering societies of Columbia University, New York; Lafayette College, Easton, Penn.; and Lehigh University met jointly at Lehigh University, South Bethlehem, Penn., April 26 and 27. On the evening of April 26 a meeting of the three societies was held in Williams Hall. On April 27 the program included visits to the Bethlehem Steel works; the New Jersey Zinc works, and the Atlas cement works, at Cementon.

National Association of State Mining School—A meeting of this association was held in Lawrence, Kan., April 12 and 13. The principal business was the consideration and preparation of a bill to be presented to congress providing for appropriations from the proceeds of public land sales for the benefit of mining schools, in the same way that appropriations of such lands have heretofore been made for agricultural schools. The following officers were chosen: President, Erasmus Haworth, University of Kansas, Lawrence, Kan.; vice-president, M. E. Wadsworth, dean of the department of mining and metallurgy, Pennsylvania State College; secretary, A. H. Purdue, State University of Arkansas, Fayetteville, Ark. The bill will be presented to Congress by the legislative committee, consisting of Victor Alderson, president of the Colorado State School of Mines, and M. E. Wadsworth; the latter being specially charged with the duty of collecting and preparing facts and arguments to be presented in advocacy of the bill.

Industrial

E. P. Leadbetter has been appointed manager of the Pittsburg office of the Buffalo Forge Company. For the past three years he has been at the Philadelphia office, and previous to that time at the factory office in Buffalo, N. Y. C. L. Dean, who until lately has been in charge of the Pittsburg district, has gone into mining operations in Mexico.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company in Jersey City, N. J., the old board, consisting of Edward F. C. Young, John A. Walker, Edward L. Young, William Murray, George T. Smith, Joseph D. Bedle and George E. Long, was unanimously re-elected. The board of directors re-elected the following officers: E. F. C. Young, president; John A. Walker, vice-president and treasurer; George E. Long, secretary; Judge Joseph D. Bedle, counsel.

The Fried. Krupp Grusonwerk, Magdeburg-Buckau, Germany, gives notice that it has added to its works a separate metallurgical department, which will occupy itself with the manufacture of furnaces, machines and apparatus, as well as complete installations for the recovery of metals from ores, either by metallurgical or by electro-metallurgical processes, and which will also undertake the working out of plants for metallurgical treatment of lead and zinc dust, waste products, and for the concentration of refractory ores. The company has the experience of eminent experts at its disposal for properly designing, erecting, and operating such plants. In particular cases, it is also in a position to ascertain by reliable tests in what manner it is possible to attain the most economical results on a large working scale.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Niles-Bement-Pond Company, 111 Broadway, List No. 13. Second-hand Metal-working Machinery. Pp. 51, paper, 5x7 inches.

Rapid Economy Stamp Mill Company, San Francisco, Cal. Rapid Economy Stamp Mill. Pp. 18, illustrated; paper, 9x12 in.

Mussens, Ltd., Montreal, Canada. Catalog No. 11. Metallurgical Machinery. Pp. 47, illustrated; indexed, paper, 5x8 in. March 1, 1907.

Garvin Cyanide Extraction Company, Portland, Oregon. Bulletin No. 3. Garvin Cyaniding Appliances. Pp. 18, illustrated, paper, 6x9 in.; 1906.

The Green Fuel Economizer Company, Matteawan, New York. "How to Save 15 per cent. of the Coal in Making Water Gas." Pp. 8, illustrated; paper, 6x9 in.

Allis-Chalmers Company, Milwaukee, Wis. No. 4002. Allis-Chalmers Direct Current Motors and Generators Type "K." No. 4003. Electric Hoists. No. 4004. Allis-Chalmers Polyphase Induction Motors. Pp. 4, illustrated, paper, 3½x6 in.; 1907.

Construction News

Angels, California—It is expected that a mill will be erected at the Etna King mine. F. F. Ames, Angels, Calaveras county, Cal., is manager.

Idaho Springs, Colorado—Denver and Eastern people are interested in the Humboldt property on Ute creek, near Idaho Springs, and they propose to install a power plant, including air compressor. Frank C. Smith, 720 Ogden street, Denver, Colo., is agent for the owners.

Columbine, Colorado—The Consolidated Silver-Gold Mines Company, in which Iowa people are interested, is figuring on the erection of a stamp-mill and cyanide plant to handle the ores of its group in Hahn's Peak district. L. A. Stillwagon, Glenwood Springs, Iowa, is president of the company, and the office is located at Hahn's Peak, Colorado.

Cedartown, Georgia—The Woodstock Iron and Steel Company has leased the Cherokee iron mine, and is preparing to develop the property. It will need a steam shovel and other mining machinery; also ore washers, a pumping plant and pipe line for water supply. J. M. Barr, Norfolk, Va., is president; J. B. Carrington, Woodward building, Birmingham, Ala., general manager.

Butte, Montana—The Pilot-Butte Copper Company is planning for the equipment of its mines in Butte with an engine and compressor to be driven by electricty. William P. Jahn, of Milwaukee, will have charge of the work and selection of the plant and will arrive in Butte shortly to confer with other members of the company in regard to the plant. He will stay at the Thornton, in that city.

Cripple Creek Colorado—Notice is given that bids for the construction of the proposed deep drainage tunnel through the Cripple Creek mining district will close on May 15 next. The tunnel will be built by the Cripple Creek Drainage and Tunnel Company, composed of leading mine-owners of the district. E. D. Marr is secretary, with office in the Mining Exchange building, Colorado Springs, Colorado.

Copper River District, Alaska—The Copper River & Northwestern Railway is under construction from the tidewater terminal at Katalla, Alaska, through the Copper River valley, to the interior of Alaska, about 500 miles of railroad in all. A breakwater about one mile long will be constructed at Katalla. This road is one of the J. P. Morgan and Guggenheim interests in Alaska, and will be built by the Katalla Company. M. K. Rodgers, president and general manager, Seattle, Wash.; John Krey, chief engineer, Katalla, Alaska. Contracts for the whole or any part of this work will be let immediately.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

April 17—As communication is re-established with the mining camps in the higher mountains of the State, it is found that more or less damage has been done by avalanches, and that several surface plants have been destroyed during the recent storms, including a few stamp mills. The worst damage, however, has been done to ditches and pipe-lines for bringing in water. It may take several months to repair all the injured places on these lines, and some mines must lie idle until the roads are in order so that supplies may be hauled in. Bridges and electrical plants have been washed away at various points, and at nearly all the camps mines have been more or less flooded, and the pumps have been kept busy at unwatering. In the meantime the miners have had to take a vacation from work. All this will have more or less influence in the bullion output of the current year.

The Mountain Copper Company's electric railroad from Boulder, on the Iron Mountain railroad, to the Hornet mine has been completed, so that ore may be shipped from the Hornet to the smelters at Keswick. There are large reserves in this mine, though the copper ore is of a lower grade than that at the Iron Mountain. Since the resumption of smelting at Keswick, the company is paying as follows, for quartz ore for flux: On ore running from $3 to $15 per ton, 65 per cent. will be returned to the shipper, no smelting charge; from $15 to $25, 77½ per cent., no smelting charge; from $25 to $200, 90 per cent., $3.50 per ton, wet weight, smelting charge. Ninety per cent. of the silver paid for if assaying over 5 oz. to the ton; less than 5 oz. silver to the ton is not paid for. Ores running low in silver are liable to an additional smelting charge. All gold paid for at the rate of $20 per ounce, and silver on New York quotations at date of sampling. All ores must be delivered free at the company's works in lots of not less than 10 tons. The payments are made on the basis of dry weights.

As before noted, the débris barrier erected at Daguerre point on the Yuba river, has been partially destroyed by the recent floods. The first dam built by the California Débris Commission at this point, of brush rock and gravel, was washed out. A dam was then built of brush fascines loaded with rock, but this was all destroyed by the first high water. A stronger dam was then constructed of piles, large rocks and concrete blocks, which stood three high-water seasons and was supposed to be effective. This too has now gone and the Federal Government has canceled the contracts for further work on the barrier. Whether more work on the barrier will eventually be done remains to be seen. Congress had appropriated $175,000 for this year's work but this has been stopped. The project outlined called for an expenditure of $800,000 half to be paid by the Government and half by the State.

A recent discovery of native copper in Diamond Creek district in the Low Divide region of Del Norte county, by F. Zaab and G. H. Crawford, has revived interest in that section. The Low Divide is only a few miles south of the Oregon line. Over 50 years ago copper ore was sacked, and shipped from that point to Swansea.

J. A. Adams and W. E. Horton, former manager of the Oriental Reduction Works, of Portland, Oregon, are in Oroville, negiotating with the dredging operators to purchase the sand which at present is washed out into the tailings. The object of the company is to secure this sand for the platinum which they assert it contains. Experiments will be conducted in Oroville to determine in some manner the values in platinum which the sand carries. When this is approximated an offer will be made to the dredging operators. The plan as explained by Adams is to handle the sands at Oroville by a washing and gravity process and then ship them to Portland for reduction.

The United States Government has placed an order for 2000 squares of slate with the Eureka slate quarry at Slatington, six miles north of Placerville. This will be shipped to Cheyenne. Wyoming, to be used in roofing Fort D. A. Russell. Under the management of C. H. Dunton, superintendent, the quarry has become a good paying property.

There is considerable confusion in Greenwater district, Inyo county, over recording location notices to mining claims. It appears that the retiring county clerk permitted a large number of notices to accumulate without returning them prior to the expiration of his term of office, and they lay huddled away together in a box in the county clerk's office. When it is positively necessary that the papers must be had, the locators are compelled to retain a member of the legal fraternity at Independence, the county seat, to search the box, recover the documents and send them on, for which a fee is imposed of $5. There have been no notices returned since August, and many of the prospectors are suspicious as to whether they have had their locations duly recorded or not.

Salt Lake City

April 19—A special meeting of shareholders of the Star Consolidated Mining Company has been called for May 8, at which time the matter of consolidating with the Black Jack Mining Company will receive consideration. If proposed plans are ratified, the Star Consolidated will be absorbed by the Black Jack. The capitalization of the latter will be increased from 300,000 to 1,000,000 shares; out of which Star Consolidated shareholders will receive 500,000; those of the Black Jack 300,000 shares; and the balance, or 200,000, will go into the treasury.

Much mining activity is in evidence in Beaver county. Recent developments in the Beaver Lake, Star, San Francisco, and Pine Grove districts have resulted in increased attention to that region. In the Beaver Lake district, copper predominates. In the Star district producers of high-grade silver-lead ore have been opened.

The March output of the Cactus mine of the Newhouse Mines and Smelters Corporation amounted to about 15 cars of crude ore while there was sent to the mill for treatment an average of 800 tons per day.

It is expected that work will be started on the Caliente & Pioche Railroad within the next week. Contractors expect to have the line completed to Pioche, Nev., not later than September.

Shareholders of the Silver King and Keith-Kearns mining companies, operating at Park City, have agreed on terms of consolidation. Several adjoining properties, including the Odin mine in Thaynes cañon, will be brought into the merger, and all will form the basis for the formation of what is to be known as the Silver King Amalgamated Mining Company.

Ore and bullion settlements reported to Salt Lake banks last week amounted to $521,600.

Preliminary work has been started on the extension of the aërial tramway operating out of the Alta district. The ropeway is owned by the Unity Mines Corporation, with headquarters in New York. The total length will be about nine miles, which is the distance between Alta and Wasatch, the lower terminal. A branch of the Rio Grande Western Railroad will connect at the latter point.

April dividends have been declared by a number of Utah mining concerns. The Beck tunnel will pay $40,000; Grand Central, $25,000; Bullion Beck, $10,000; Victoria, $10,000; Utah, $3,000; $88,000 in all.

Scranton

April 23—James E. Roderick has been reappointed chief of the Bureau of Mines of the State of Pennsylvania by Governor Stuart. He is a high authority on mining matters and is making a strenuous effort to improve the mining laws of the State.

G. B. Markle & Co., the independent operators of Hazleton, are making efforts to beautify the towns owned by them by planting trees in large numbers on the streets.

Dr. D. H. Lake, the surgeon in charge of the Delaware, Lackawanna & Western mines, has opened a course of instruction in first aid by taking the hospital car to the collieries and there instructing the men in the principles of the work.

The Lehigh Coal and Navigation Company is giving attention to the question of transporting coal by its canal rather than by railroads. A large boat-building plant is to be located at Weissport and improved machinery installed. Upward of 300 additional boats are needed, and with the improved facilities there will undoubtedly be an increase of the demand among shippers. Electricity is to be tested as the motive power and it will be furnished from the company's plant at Lansford. Hauling by mules will be entirely abolished. With the improvements contemplated there will be an effort to compete with the railroads in the shipment of merchandise of all kinds also. The company has formed a canal freight organization and in this manner hopes to reach the trade.

Commissioner C. P. Neill has completed his labors as the umpire of the Anthracite Conciliation Board, and handed in his decisions in the remaining cases. The four cases were as follows: One decided in favor of the men was from the contract miners of the Grassy Island colliery of the Delaware & Hudson Company, who claimed discrimination had been shown in that two men had been allowed to work two chambers and had been furnished cars according to the number of chambers operated, rather than according to the number of miners, as provided in the award of the Anthracite Commission. The umpire held that the grievance was a proper one and decided against the company. All the other grievances related to alleged reductions of various kinds, and were decided against the men.

Toronto, Ont.

April 20—Two new mining divisions are to be created in Ontario, one of which will embrace the Larder Lake area, and the other the new Lady Evelyn and Montreal River fields. Each will have a recorder's office for the filing of claims and other business, which will be a great convenience to mining men.

E. T. Corkill, provincial inspector of mines, returned recently from a visit to the Port Arthur district. He reports that a force of men is at work taking out ore at the West End silver mine, and that a concentrating plant will be started in a few weeks. The opening of the blast furnace of the Atikokan Iron Company, which was expected some time since, has been delayed on account of the non-arrival of machinery. It is now almost completed, and will be in position to begin operations as soon as navigation opens and a supply of coal can be obtained. Mining operations have been much interfered with throughout that district by the severe winter and the depth of snow.

The reduction plant now being erected at Sturgeon falls for treating and refining cobalt and copper ores is making good progress. The building is complete, including a laboratory and sampling works, and the company will be ready to sample all descriptions of ores this month. The reduction plant will be ready for operation in July. The company will shortly be in the market to buy ores.

London

April 13—In my letter last week I gave some particulars as to the Rio Tinto Company, and mentioned that rumors had been circulated relating to a proposed increase in the output of copper; but that so far the directors had not made any public pronouncement on the subject. At the general meeting of shareholders C. W. Fielding, the chairman, gave some information which was of interest. The chief anxiety under which the directors labor is caused by the shortness of water supply. This trouble is always more or less with them, but during the past two years it has been acuter than usual. For the 33 years that the company has been in operation the average rainfall has been 28 in. a year. In 1905 the fall was only 20 in., and in 1906, 18 in. The company has large reservoirs, one of which alone can hold two year's supply. Unfortunately, for several seasons the reservoirs have been partially empty, and at the present time there is only a few months' supply. Every possible way of increasing the supply has been adopted; also, re-use of waters, and rigid economy. The directors are very much afraid that unless there is an increased rainfall it will be necessary to restrict the output during the latter part of this year.

As regards the increase in the output, it is now definitely announced that additional furnaces have been erected, with the object of treating ores of lower contents than are treated in the existing smelters, but that it has not been found possible to put them in operation up to the present time, the chief hindrance being that no water can be spared for the water jackets. The question of increasing output depends entirely on the water supply and at the present time such an extension seems likely to be hung up indefinitely. This will be bad news for shareholders, who have been buying the £5 ordinary shares at £100, on the strength of a rumor about increased output. Rio Tintos ought not to be bought on rumors. It is much better to act on the information given officially which, if not voluminous, is reliable and businesslike.

I have often mentioned the fact that, during the depression in Cornish mining, the Cornish smelters and other moneyed men there provided a good deal of capital to develop and work tin properties in other parts of the world. One of the most successful of these outside ventures is the Tronoh Mines, Ltd., which was formed in 1901 to acquire properties in the Kinta district of Perak, Straits Settlements. At first the properties were only taken on lease, but last year a portion of them was purchased outright. The board of directors includes such well known Cornish names as Pearce, Bain and Thomas. The profits derived from the operations have been gradually increasing, and up to the end of 1906, the capital had been more than returned. The distribution during 1906 has amounted to 50 per cent. on the capital of the company, which stands at £160,000. The year shows an income of £199,464, derived from the sale of 1875 tons of concentrates, and a net profit of £99,537. There seems to be every prospect of the mine continuing to pay handsomely.

Johannesburg

To show what a serious state trade in the Transvaal is now in, a statement has been made of the insolvencies for 1906. Voluntary surrenders for the whole of 1906 numbered 117, and compulsory sequestrations 348, a total of 465.

This is the time of the year when the annual reports of the gold mines commence to roll in. During the past week the annual meeting of the Witwatersrand Deep was held. When this mine started up, about 10 years ago, it was under a cloud, the results obtained being unsatisfactory. The latest report shows a vast improvement. The monthly profits have shown a steady increase from £15,000, in January, to £20,000 for December. A dividend of over 40 per cent. was paid for 1906. With regard to Chinese labor the manager states that "they have steadily continued to improve in efficiency, and have become very satisfactory underground workers." It is satisfactory to note that the development in the bottom levels is looking extremely well. At the meeting the chairman emphasized the interest that the larger companies on the Rand are taking in the welfare of the men on the mines, by the building of comfortable quarters, recreation halls, hospitals, and the like.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Amalgamated Copper Company—This company has made no increase in its dividend for the last quarter. It is $2 per share, or 2 per cent., the same as for the previous quarter. The dividend for the corresponding quarter last year was $1.75 per share.

Arizona

COCHISE COUNTY

Some 700 miners in the Bisbee camp are out on a strike, which was recently ordered by the Western Federation of Miners. All the mines in the district are affected.

YAVAPAI COUNTY

Bannie—It is stated by the management of the Bannie company that this mine will pass into the hands of new owners soon. The Bannie has been a producer, and at this time there are large bodies of low-grade ore in sight.

H. J. Beemer Co.—This company has taken an option on another group of claims in the Hassayampa district. This company now has a holding of about one square mile in the vicinity of the Storm Cloud mine, 10 miles south of Prescott.

Chronicle Gold Mining Company—The annual meeting was held in Prescott, April 10, at which a new board of directors was elected and a program of development mapped out. The mines owned by this company are four miles east of Prescott, and are reached by an excellent wagon road.

Coronado Gold Mining Company—This company, whose mines are two miles west of Congress, has again resumed work. Preparations are now being made to install a mill and tramway to connect the mine with the mill.

Martin Group—George Roper and associates have taken over this group in the Copper Basin district. Some work has been done on the group, and quite a large amount of medium-grade ore has been exposed.

Rosalie Copper Company—This company, whose mines are situated 18 miles east of Mayer, has made its initial shipment, and it will be a regular shipper in the future. This company has been pushing development for the past year, and now has a quantity of ore blocked out. The ore now being shipped was taken out in development work.

California

AMADOR COUNTY

The heavy storms flooded many mines and caused them to be closed down. Mills and chlorination works closed down from lack of rock and sulphurets. There is also a scarcity of both wood and oil fuel.

BUTTE COUNTY

The city of Oroville, recently flooded badly by the Feather river, is about to build a high levee nearly a mile long. El Oro and Butte dredging companies will dig and build the levee free of cost for the gold they hope to obtain by the operations.

CALAVERAS COUNTY

North Star—This property at Angels has been sold by Garland & Madison to A. D. Thompson, of Plainfield, N. J., who will do extensive development work and increase the capacity of the mill. The mill tests on ore proved satisfactory.

Grand Oaks—J. T. Thompson is about to begin work on this mine near Mokelumne hill. The mine has never been equipped with milling facilities, though more or less ore has been crushed in custom mills.

EL DORADO COUNTY

San Francisco men intend commencing to dredge the gravel deposits on the Dormody ranch at Green valley.

INYO COUNTY

The well being sunk north of Greenwater has been abandoned, after a depth of 1000 ft. was reached, greatly to the regret of the miners. It is probable that water will have to be brought in from the Brooklyn springs in the Panamint region. A smelter is being put up 20 miles from the camp at a point where there is plenty of water.

Furnace Creek—This company commenced shipping small lots of ore to Salt Lake, by way of Amargosa. The Copper Blue shaft of this company is now 540 ft. down.

KERN COUNTY

Zenda—The mill at this mine will shortly be started up. The severe weather this winter has retarded operations at the mines in the district.

NEVADA COUNTY

North Star Mining Company—The 300 employees have all reported for duty, the underground workings of this mine at Grass Valley having been cleared of water after several weeks' continued effort.

PLACER COUNTY

Ophir Valley—This company now owns the Hathaway, Kirkland, Butts and Eureka mines, between Ophir and Newcastle, the united properties extending 4615 linear ft. The Hathaway and Butts have been worked, but the others are new mines. On the Hathaway a shaft 815 ft. deep has been sunk, but it has never been worked below the 600 level. An electrical plant for hoisting and pumping is being put in, as well as a compressor and drills. A. S. Eastwood is superintendent.

RIVERSIDE COUNTY

Gypsum—H. R. Adams and G. M. Herndon, of Los Angeles, and T. A. Blakely, of San Bernardino, have taken up some 2000 acres of gypsum-bearing lands 30 miles west of the Colorado river, and 10 miles west of the Santa Fé cut-off. No work has been done upon the deposits thus far.

SHASTA COUNTY

Mount Shasta—This mine is to be sold on May 1 to satisfy claims of $50,000 of Phelps & Cleland, who hold a trust deed to the property, made by the Mount Shasta Gold Mines Corporation in 1901. The sale will include mine, machines, buildings, etc.

Mammoth—This company is now employing 800 men at the mine, and 300 on the new railroad. Manager F. Logan says that two additional furnaces will be immediately erected. Three furnaces are at present in operation.

Gold Leaf—The owners of this mine are building a two-mile tram to connect with the main line tracks at Middle creek, so that ore may be shipped to the smelters.

Lyons Consolidated—This mine at Old Diggings is to be sold under a deed of trust on May 15 next.

Electrical Furnace—The new furnace for the iron smelter on the Pit river has been finished in San Francisco, and will be shipped to Heroult at once.

SAN LUIS OBISPO COUNTY

Consolidated Quicksilver Company—The mines of this company at Klau have been badly flooded, but Superintendent Bagby will soon have them in order again so as to put on a larger force of men.

SIERRA COUNTY

A snowslide has carried away the five-stamp mill and damaged the power line at the Telegraph mine, at Fir Cap. At the Keystone mine, near Sierra City, a snowslide destroyed the 10-stamp mill, compressor house, and buildings, but no lives were lost. The miners have been two years reopening this mine, and it is somewhat doubtful if the plant will be replaced.

SISKIYOU COUNTY

De Nune & Benton—In this mine, Quartz valley, 25 miles from Yreka, ore carrying very beautiful leaf gold, is being taken out. One piece taken out recently yielded $6000.

TRINITY COUNTY

Bonanza King—At this property, Trinity Center, the 40-stamp mill has commenced crushing the high-grade ore recently mined.

TUOLUMNE COUNTY

Jessie—Work has been resumed on this drift mine on Table mountain, under superintendency of C. A. Fuller.

Colorado

BOULDER COUNTY

Lost Lake—Denver and Eastern people are interested in this property in Grand Island district, and they are preparing to install a plant of machinery: Wilson Davis, Eldora, Colo., is manager.

CLEAR CREEK COUNTY

Black Forest—Wells Brothers, of New York, are reported to have purchased this property on Trail creek, and will operate in connection with other holdings.

Maud S—Denver people have become interested in a lease and bond on this group on Columbia mountain, consideration being $20,000 for two years. Michael Kelly, Georgetown, Colo., is in charge.

Peruvian—Denver and Eastern people are reported to have completed arrangements for the purchase of this property in Argentine district, consideration being over $100,000.

Waldorf—It is reported that negotiations have been closed for the sale of these properties in East and West Argentine, English people being the purchasers. E. J. Wilcox, Colorado Building, Denver, Colo., is manager.

LAKE COUNTY—LEADVILLE

Adams Mill—The Western Mining Company, on Carbonate hill, is treating 200 tons of raw material daily that comes from the Wolftone. The mill is supplied with Wilfley and Card tables and Huntington mills. From these mills the ore is distributed to the tables and by careful adjustment four separations are made: a lead concentrate, a second-class iron and zinc, a zinc product, while the silica containing the minimum of zinc passes out to the tailings. A system of settling tanks is adopted which insures the saving of a considerable quantity of mineral. The loss in bulk over the tables is not over 12 to 14 per cent.

Colorado Concentrating Company—This company was organized by local men to work the dumps of the Morning and Evening Star mines. The old McHarg shaft and engine room have been secured and are being remodeled to accommodate crushers, concentrating tables and jigs. The dump material is a low-grade lead carbonate, thrown away during the early days, and lends itself readily to the concentrating process; it is estimated that the dumps contain 100,000 tons of this material. The company will treat 200 tons daily and will concentrate six tons into one, the output being a good grade of concentrates. The mill will be ready to start soon.

Crescent—A this mine, on Carbonate hill, the Crescent is shipping 400 tons monthly of manganese ore. Recently a good body of ore carying from 23 to 25 oz. silver per ton was opened, but it is of such a peculiar combination that a market has not been found for it yet. It is iron, but too silicious to ship under the schedule, and there is too much iron to bring it under the silicious schedule.

Sunday—At this mine, Ball mountain, a good body of silicious ore has been opened in one of the upper levels; the ore was found in the porphyry. In addition to this work, the lessees are sinking the main shaft to 450 ft. depth.

ROUTT COUNTY

George Shumway and Frederick Henry, of Colorado Springs, have purchased a tract of land containing 1000 acres in Twenty-Mile Park, paying for it $40,000. The new owners will mine for coal. Property is located near Steamboat Springs, and was purchased from John A. Whetstone.

Indiana

CLAY COUNTY

The Heck mine, south of Brazil, is shut down, because the miners were compelled to work by the day scale of $2.56 instead of receiving the block scale of 95c. a ton, and the miners appealed to the district officers. President Kirkland, of the United Mine Workers, ordered the miners out till scales had been put in and the mines had been equipped to pay by the ton. While the company was paying the union scale for day work, the agreement prescribes that coal shall be mined by the ton. This is the first case of the kind in district No. 8, the block-coal district.

GREEN COUNTY

Linton Coal Company—A receiver has been appointed for this company on the petition of its stockholders. The company was organized in 1903 and acquired, by purchase and by lease, 600 acres of coal lands near the Sullivan and Green county lines. In acquiring the lands, and making preparations for the mining of coal, $127,851 was expended. The officers of the company then leased the property to the Diamond Coal Company for a period of 15 years. The complainants say the income from the lease is insufficient to meet the fixed charges, and the receiver will attempt to have the lease set aside.

Michigan

KEWEENAW COUNTY—COPPER

Phoenix Consolidated—The control of this property has passed from the Stanton interests to the Keweenaw Copper Company which intends to explore and, if advantageous, develop the property in connection with its present holdings. The purchase price is not stated.

ONTONAGON COUNTY—COPPER

Copper Range—A special meeting of the stockholders is called for May 1 to authorize the issue of 15,000 shares of new stock, which will make the total outstanding 400,000 shares, less the small amount not exchanged for subsidiary stocks. It is planned to give 10,000 shares in exchange for the Globe tract, now under option from the John Stanton estate, and the other 5000 shares will be placed in the treasury and issued as may be needed to provide funds for the development of this tract. The Globe contains 1280 acres, and is immediately north of the Champion. The option was obtained April 20, 1905, and does not expire until next year.

Increase in Wages—An increase of 7 per cent. in the wages of the men at the Michigan, Adventure, Mass and Victoria mines was announced April 13, to take effect May 1. Trammers will henceforth receive $2.25 and miners $2.50 per day. The new rate will benefit about 1000 men.

Missouri

ZINC-LEAD DISTRICT

The developments along the Center Creek bluff, north of Webb City, the last year point to a future for that part of the mining district lying between Webb City and Oronogo. The Yellow Dog on the land of the Underwriters' Land Company started everything with greater vigor than ever before known. The bluff idea has scarcely been exploited, but for 1½ miles west of the Yellow Dog drill-holes have found the core of the blanket vein of zinc-lead ore. The Rochester Land and Leasing Company purchased the Hendrickson fee of 40 acres west of the Yellow Dog. On this land the Red Dog mine has demonstrated the existence of the vein. West of the Red Dog is the 10-acre lease

purchased by Chapman & Lennon, owners of the Red Dog, on which three drill-holes indicate the further western extension of this vein. Ball & Gunning have proven by drill that it extends west across the next 40 acres. Still west the Big Stick Mining Company and the Providence have it; and still west of this Geo. H. Davis has 19 drill-holes, every one in ore. West across the McReynolds, Whitworth & Howard tract, drill records continue, with no apparent break in the vein. This stretch of territory is 1½ miles in length and the vein is found on a level, differences in the depth from the surface being due to the variations of the surface.

State Mine Inspector Walter Ragland, Webb City, says that 150 men are needed in the mines between Oronogo and Duenweg. Men are needed as badly in every other portion of the district. The sharpest demand is for experienced miners, but there is also a strong demand for men who are willing to learn.

Cathedral Mining and Smelting Company—This company, while producing considerable ore from its land between Prosperity and Duenweg, is also prospecting by drilling and has made a good strike. The drill penetrated 60 ft. of lead and zinc ore. This land adjoins the Cosgrove land.

Cosgrove Land—H. H. Culver, of Joplin, associated with some Michigan copper-mine owners, is drilling a 10-acre lease of the Cosgrove land near Duenweg and has encountered lead in tallow clay at a depth of 185 ft., an unusual occurrence in this district.

Elking Lead and Zinc Company—This company, through its manager, L. Kreilsheimer, has closed a contract for a new 400-ton mill on a lease of the Little Princess Mining Company, north of Webb City.

State Lead and Zinc Company—C. S. Hollywood, of Webb City, superintendent of this company, operating on a 7-acre lease of the Rochester Land and Leasing Company, north of Webb City, is developing the sheet run of ore at the 150-ft. level. He has added a six-drill compressor and a 100-h.p. boiler to the mill, put down a new shaft and sunk the mill shaft to the blanket vein, where a 15-ft. face of zinc and lead ore has been exposed. On a recent trial run of 200 tubs, 8000 lb. of zinc ore and 1500 lb. of lead ore resulted.

Wampum Mining Company—This company, W. S. McCord, of New York, president, and E. H. Johnson, of New York, treasurer and resident manager, is operating on a 14-lot sub-lease of the Bash Development Company's lease of the Weymann land at Midway, east of Joplin. Drifting operations are being pushed on the 135-ft. level and the mine is outputting 20 to 30 tons of zinc ore per week. The orebody is in new ground.

Montana

Butte District

Bullwhacker and Amazon-Butte—Each of these companies is shipping about 100 tons of copper ore a day to the Washoe. Some high-grade red oxide of copper has been struck at a depth of 65 ft. in a new shaft on the Amazon. The vein is 4 ft. wide, the largest body of this class of ore that has ever been found in Butte.

Butte Coalition—This company is cutting a station at the 1000-ft. mark in the new shaft on the Tramway and driving the tunnel that is intended to tap the Rarus shaft at 210 ft., with about 50 ft. to go. Its output is about 1100 tons a day, the greater part of which is coming from the Minnie Healey and Rarus. Orebodies in the former are greater than they have ever been since the company secured control of the property. The Corra is still a small producer, but the ore is low grade. Development is progressing in the lower levels of this mine. The Rarus shaft has reached a depth of 2100 ft. and will be continued to the 2500 after a station is cut at the 2100 level.

Colusa-Leonard Extension—At a depth of 560 ft. the shaft struck the apex of a vein 10 or 12 in. wide that has since widened to 5 ft. The filling is improving in quality with depth, some of it being copper glance, in bunches, and all averaging well in copper. Since the vein was struck 15 ft. has been sunk and the entire bottom of the shaft is in ore. The property is located west of the Greenleaf, north of the Pittsburg and southeast of the Butte & London.

North Butte—This company has made final payments on all mining claims it had under lease and bond, the last two being on the John Emmett and Lynchburg. It now owns 17 full claims and fractions outright, control in the Croesus and a minority interest in three others. It is preparing to resume work in the old shaft on the Berlin with a view of taking it down 1600 or 1800 ft. and connecting it with its deep workings farther south; it will use the hoisting engine that did duty at the main shaft before the installation of the new one last summer. This engine is good for 2500 ft. Ore production is about 1400 tons a day.

New Companies—Many of the new companies are pushing development work. Butte & London is again sinking, the bottom of the shaft being close to the 850-ft. mark. No commercial ore has been cut in the work, but none is expected until the 1500 is reached. The shaft on the Colusa-Leonard Extension is 500 ft. deep and is passing through a 10-ft. vein of mineral-bearing ore that will evidently make into copper with depth. The shaft on the Amazon-Butte is 265 ft. deep, and while no ore is coming from it, lessees operating part of the property are mining between 75 and 100 tons of 4 per cent. copper ore a day at a depth of 65 ft. This vein has an east and west course, and its width is not known, for although it has been crosscut 20 ft. only one wall has been found. The property of the company consists of the West Altona, Amazon and Gaynor claims, the location of which is on the east side of the flat. Butte & Bacorn is developing rapidly. Its Belinda shaft is now 745 ft. deep and its Calumet 695. Exploration work is in progress in the Colleen Bawn claim, on which there is a 300-ft. shaft.—Butte Central & Boston is cutting out a third compartment of its shaft from the 500-ft. station to the surface and mining ore on the 100-, 200- and 300-ft. levels.

Nevada

Esmeralda County—Goldfield

The labor troubles caused by the dispute between the Industrial Workers of the World and the Western Federation of Miners, which has disorganized mining and business operations on this field for the past five weeks, has been settled by the withdrawal of the Industrial Workers from Nevada. The miners' unions in all the Western States have for years been affiliated with the Western Federation of Miners. Recently the rival association established a Nevada branch in Goldfield and commenced to teach strongly anarchistic doctrines which alarmed the officials of the Western Federation and the principal mine-owners. Meetings were held and plans arranged, with the result that after a struggle the Industrial Workers were compelled to retreat from the State.

Nye County—Bullfrog

Montgomery-Shoshone—At a meeting of the directors in New York, last week, Donald B. Gillies was chosen president, to succeed Charles M. Schwab, resigned. C. M. Ward was elected vice-president, in place of Mr. Gillies.

Nye County—Rhyolite

The railroad to Rhyolite from Tonopah is approaching completion. At the present time the graders are at work on the outskirts of Bullfrog, and surveyors are laying out the depot yards and the ground for the erection of freight sheds. The work of laying the rails has been started. In view of the rapid improvement in transportation facilities there is a notable activity in mining. Already the leading properties have large bodies of rich ore ready for shipment.

Indications of oil have been discovered about six miles south of Rhyolite, and a number of claims have been staked. The pioneer locators have formed a syndicate, and have ordered a drilling plant from Los Angeles, which they expect to have in operation within the next six weeks. The ground formation is sandstone and shale, and there are numerous fissures giving off natural gas. The soil is soft,

and it is believed that drilling costs will be low. The development of the field will induce capitalists to test other districts in Nevada, where there are numerous indications of oil deposits. The development of a large oilfield would be a great boon to the goldfield, as at present all the camps are suffering from a fuel famine.

Mayflower Consolidated—A valuable strike has been made on the 300-ft. level in the west drift at a point about 15 ft. from the shaft. A quartz vein showing free gold and assaying up to $30 per ton has been cut. The company is sinking a new shaft on the Starlight claim, with a view of developing the western ground. This shaft is also on the Mayflower vein, which in the Starlight ground carries ore of milling grade.

Mayflower West Extension—Rich ore has been encountered in the west drift 100 ft. from the shaft in the 250-ft. level. Some of the assays give very high returns. The workings on the other levels are also in ore of milling grade.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah Railroad for the week ending April 11 were: Tonopah Comapny, 250 tons; Belmont, 490; Montana-Tonopah, 185; Midway, 46; total, 971 tons. In addition to this the Tonopah Company sent 3005 tons to the mills, making a total of 3976 tons for the week.

Ohio

PERRY COUNTY

Peabody Coal Company—This company has issued $150,000 in 6 per cent. first-mortgage bonds. The property is known as the Greely mines, near McCunesville, and consists of 1655 acres of coal, of which the company owns in fee 977 acres and under lease 678 acres. The company also owns in fee 773 acres of surface. The mine equipment is new and has a present capacity of 300,000 tons of lump coal per annum. The company owns its own railroad, connecting with the Baltimore & Ohio, and by constructing 5 miles of track connection can be established with the Toledo & Ohio Central and the Zanesville & Western. The proceeds of the bonds will be used for improvements and working capital.

Oregon

BAKER COUNTY

A correspondent writes from Homestead: It has been known that there were large bodies of copper ore in this camp ever since the discovery of the Iron Dike mine about nine years ago. At that time the mines were taken over by the Northwest Copper Company, which also succeeded in getting the right-of-way for a railroad along the west bank of Snake river from Huntington to the mines, a distance of about 65 miles. Part of the grade was built, but the company was unable to complete the work and later got into litigation which was not settled until late in 1906. Since that time the mine has been under development. The railroad has been re-surveyed and early in February, 1907, construction work was started. Since the railroad is assured, mining men have taken under bond the following groups; Farrell, Gelett, O'Toole, Conger, Taylor, Carnyhan, Foster, Homestead and Two Shoes. All are under development. There are several other groups under bond or options, that work will start upon soon. Mr. Winslow in 1906 organized the Ox Bow Electric Power Company, which is at present working some 75 men building wagon roads, and other preliminary work. The river forms a bow and the purpose is to tunnel through about 1300 ft. and build a dam; the fall is enough to generate electric power for all purposes. It is expected that it will take about two years to complete the work now laid out by this company. There is good copper showing along the river on both sides for about 75 miles. There are several kinds of outcrops, but most attention is paid to the iron cap and gossan, while there are some outcrops of gray copper.

South Dakota

LAWRENCE COUNTY

Homestake—The fire which broke out on the 500-ft. level three weeks ago is still spreading and apparently extending its area. An upraise is now being made from the 500 level, and it is hoped to reach it this way. Tunneling and other methods have been employed in vain. No men, except the fire-fighters, are at work in the mine, all the ore now milled being taken from the open cuts and upper level tunnels. The 400 stamps in the Star and Homestake mills are still hung up. There is no improvement in conditions.

Columbus Consolidated—This company has issued a circular letter to its stockholders announcing that on May 1 the property of the Hidden Fortune Mining Company, including its mill and mill site, will be transferred to and become the property of the Columbus Mining Company. The terms are the payment of the Hidden Fortune Company's debt, amounting to about $240,000, and the issue to the stockholders of the Hidden Fortune of 2,000,000 shares of Columbus stock, less the bonus of stock given to sell the before mentioned amount of bonds. The Columbus Company has authorized the issue of $400,00 first-mortgage bonds.

PENNINGTON COUNTY

Wolfram Strike—The richest wolfram ore yet discovered in this section of the country was found recently a quarter of a mile from Keystone. It will run from 35 to 40 per cent., and is found in a well defined ledge, which crops out in the neighborhood where rich ore has previously been found. The property has plenty of water and timber.

Tennessee

FENTRESS COUNTY

United States Lead and Smelting Company—This company has been organized to develop lead deposits near Jamestown. J H. Connor, of Nashville, Tenn., and Tracy W. Pratt, of Huntsville, Ala., are among the incorporators.

Texas

The production of the Gulf coast region for March was 1,460,000 bbl., an increase of about 200,000 bbl. over that of February. All the increase was derived from Texas fields, which all made an increased output except Dayton. Consumption was 600,000 bbl. in excess of output, reducing stored crude to 6,600,000 bbl. There was a decided increase in development work, 106 wells being completed, of which 83 were producers. The Humble field was the most active, and had the largest increase in output. None of the wild-cat wells created any excitement, and the increased production was due to new wells in the old fields, where drilling has been stimulated by the high prices paid for crude. Oil, f.o.b. cars, sells for 90@95c. per bbl. Present credit balance prices, with estimated March production of the various fields, are as follows: Batson, 250,000 bbl.; 80c. Humble, 275,000 bbl.; 80c. Saratoga, 240,000 bbl.; 75c. Sand Lake, 225,000 bbl.; 81c. Spindletop, 110,000 bbl.; 85c. Jennings, 350,000 bbl.; 75c.

Utah

SALT LAKE COUNTY

Utah Copper Company—Hayden, Stone & Co. report that the first unit of 3000 tons capacity of this company's mill at Garfield is about ready to go into commission. By the time that this is in full operation the second unit of the same size should be ready. Only those who have followed this proposition closely appreciate the enormous scale on which it is laid out. The two completed sections of the mill, together with the adjoining buildings, cover a ground space of 20 acres. Each section is made up of 12 units of 500 tons each, any one of which can be operated independently. The two receiving bins have a combined capacity of 60,000 tons storage. The power plant will supply both the mill and the mine at Bingham, to which a transmission line of 17 miles is being built. It will contain 20 water-tube boilers with a total of 12,000 h.p. and the engine plant five engines, connecting with generators of 13,000 h.p. It is estimated that, handling 5000 tons a day, which will be the limit for the first six months, the maximum output will be 45,000,000 lb. annually.

Virginia

WASHINGTON COUNTY

Ackerson Creek Mining Company—This new company has leased lands near Damascus, and is preparing to mine iron ore on a considerable scale. W. L. Umbarger, Chilhowie, Va., is president; S. V. Fulkerson, Bristol, Tenn., secretary.

Washington

FERRY COUNTY

Belcher Mountain Railway—The suit for possession has been compromised, J. L. Harper, the deposed manager, having retired. F. R. McMillan is now in charge of the road and is putting it in repair to commence operations.

Winnipeg—The adit is in 830 ft. Rand drills will be used in the mine. A six-drill Leyner compressor and a boiler are ready to be hauled to the mine.

West Virginia

FAYETTE COUNTY

New River Company—This company proposes to increase the authorized capital stock from $15,000,000 ($5,000,000 thereof being 6 per cent cumulative preferred) to $25,000,000, of which approximately one-third is to be perferred stock and two-thirds common stock. There was recently outstanding $4,810,800 preferred and $9,621,600 common. It is not planned to issue any of the additional stock at present, but it is necessary to have it authorized in order to take care of any additional stock which the New River Fuel Company might put out. The New River Company is a holding company and its shares were given in exchange for stock of the New River Fuel Company in the proportion of 1 preferred and 2 common for each 1 share sold. There will be a circular sent to the shareholders when any offering is made of the new stock.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

Granby Consolidated—This company is preparing to erect at its smelting works, at Grand Forks, a large steel flue chamber with the chief object of increasing the draft from its copper blast furnaces and converters, the existing brick chambers, one of which is 11x10 ft. and 800 ft. long, not giving sufficient draft for requirements, present and prospective. The new chamber will be elevated 22 ft. above the furnace feed floor, on steel columns resting on one side on a masonry wall and on the other on concrete piers. It will be rectangular in shape, its inside dimensions, width 13 ft., hight 15 ft., and length about 313 ft. Some 250 tons of steel in all will be used in construction, and this has been ordered. That for the sides of the flue will be ¼ in. in thickness and for the top 3/16 in. A special feature of the design is that all bracing will be on the outside. A light roof will afford protection from rain and assist in bracing the top of the flue. For the more expeditious removal of the flue-dust there will be 28 hoppers in the new chamber with conveyers, operated by cable, running its full length; also auxiliary conveyers thence to the briquetting plant. The handling capacity of the conveyers will be about 50 tons in 8 hours. The approximate cost of the structure complete will be $25,000. Delivery of the structural material is expected by July next and completion of construction within three months thereafter, so that the flue should be available for use next winter.

ONTARIO

The bill for the taxation of mines has been passed by the Ontario Legislative without any alteration of the main details. It provides for a tax of 3 per cent. on the profits of mines in excess of $10,000 annually, and an average tax of 2c. per acre on mineral lands in unorganized territory. The bill amending the assessment act providing for local taxation of mineral rights, in cases where such rights have been reserved in selling the surface rights, has been amended by the substitution of the words "petroleum rights" for "mineral rights" so that properties other than oil lands will not be affected. It will probably pass in this form.

ONTARIO—COBALT DISTRICT

La Rose—Negotiations have been for some time on foot looking to a merger between La Rose Mining Company, of Cobalt, and several other extensive mining interests. This arrangement has now been effected. La Rose company is reorganized under the name La Rose Mines, Ltd., with $6,000,000 capital, and the properties passing into its hands include La Rose and University mines, the Silver Hill group, the Epplitt & Wallace in the southeastern section of Coleman township, the Princess, or J. B. 3, and a number of prospects covering about 200 acres in the Wendigo Lake district. The new company, like the former one, will remain a close corporation under the same board: John McMartin, L. Henry Timmins, Noah Timmins, D. A. Dunlap and Duncan McMartin. The policy of the company, as outlined by the board will be to store as much ore as possible until local smelters are ready to begin operations. La Rose property has probably the most extensive and thorough development of any mine in Cobalt. There has been altogether about 2000 ft. of development upon Vein No. 1, ore extraction showing a steady persistency in volume and grade. The bonanza cross-vein running nearly at right angles, partly developed by means of an open cut, shows an outcrop of 6 to 10 in. of almost pure silver.

Mexico

DURANGO

Guanacevi District—The English company, which has taken over the Restauradora property, under the management of Forbes Richard, has ordered a plant with a capacity of 150 tons per day. The Garibaldi mines have been taken over by the Mines Finance Company, under the management of John B. Farish. The San Rafael is in bonanza. The America, a leased Haggin & Hearst property, promises well.

Guanacevi Tunnel Company—Trouble is reported in the management of this company. General Whitlock, president; Hilario Losoya, vice-president; Ernest F. Ayton, chief engineer, and Andrew Meloy have resigned from the management. Mr. Squiers is now president. There has been much criticism of these changes.

Rhodes Consolidated Mines Company—This company has secured a concession from the Mexican Government of exclusive prospecting rights over an area of 110 square miles, situated about 60 miles west of Guanacevi. An exhaustive survey of the tract is being made by Pastor Roucix, who has made the only accurate map of the State of Durango now existing. Frederick J. M. Rhodes, Guanacevi, Mexico, is president; William G. Reinecke, 74 Wall street, New York, secretary and treasurer.

San Pedro District—In this camp, near Guanacevi, a group of three mines—the Nueva Australia, Soto and Porvenir—is owned by the Mexican Mining and Smelting Company, of Boston, and managed by Frank Morehouse. There is a 100-ton plant running, crushing about 2800 tons a month. The high-grade ore and concentrates are shipped to the Monterey smelter, being hauled by wagon to the railroad at Tepehuanes. Another property worked is the Sultana, where surface indications are good; a crosscut tunnel is being run to cut the vein.

Africa

TRANSVAAL

Gold production in March is reported by the Witwatersrand Chamber of Mines at 538,497 oz. fine; which compares with 493,542 oz. in February, and 443,733 oz. in February, 1906. For the three months ended March 31, the total was 1,280,029 oz. in 1906, and 1,569,677 oz., or $32,445,224, in 1907; an increase of 289,048 oz. this year.

The labor return shows that 11,146 natives were distributed to the mines during March by the Witwatersrand Native Labor Association, and that 7967 left through time expiry and other causes. There was thus a net gain of 3179 during the month, and the total number of natives employed, excluding the Robinson group of mines, was 90,841, at the end of March.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, April 24—The only incident in the coal trade in the West is the preparation for the opening of the lake trade. The severe weather has disappointed the expectations of an early opening of navigation, and coal has accumulated at the Lake Erie ports. The steam coal demand continues good, and transportation conditions are fair. In fact there is too much coal at some points, and mines are beginning to limit production.

In the East there is nothing new, and trade is moving along quietly, both in anthracite and bituminous coal. The demand is chiefly for anthracite at the present time. The coastwise trade is active.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 13 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	1,347,040	1,508,213	I. 161,173
Bituminous.....	10,092,395	10,508,027	I. 415,632
Coke.....	3,649,253	3,945,335	I. 296,082
Total.....	15,088,688	15,961,575	I. 872,88

Coal and coke receipts at Chicago, and shipments from the city, for the two months ended Feb. 28 were as follows:

	Received.	Shipm'ts.	Balance.
Anthracite.....	248,035	197,762	50,273
Bituminous.....	3,211,876	1,014,071	2,197,805
Coke.....	65,099	58,423	6,676
Total.....	3,525,010	1,270,256	2,254,754
Total, 1906.....	2,468,580	793,997	1,674,583

The difference between receipts and shipments represents, approximately, the city consumption. The bituminous receipts were: Pennsylvania, 184,617 tons; Ohio, 170,155; West Virginia, 131,577; Indiana, 668,072; Illinois, 2,057,455 tons.

Coastwise coal shipments from the chief Atlantic ports for the two months ending Feb. 28 are reported as follows:

	Anthracite.	Bituminous.	Total.
New York.....	2,617,501	1,806,589	4,424,090
Philadelphia...	326 412	681,355	1,007,767
Baltimore.....	34,503	523,651	558,154
Newport News.	.....	303,224	303,224
Norfolk	.....	196,957	196,957
Total.....	2,978,416	3,511,776	6,490,192
Total, 1906....	2,673,764	3,661,260	6,335,024

The total increase was 155,168 tons, or 2.4 per cent. New York includes all the New York harbor shipping ports.

New York

Anthracite

April 24—The situation in the hard-coal market remains practically the same as last week. Deliveries are going forward regularly and the market shows strength just before the usual rise, which will take place May 1. Small steam sizes are still scarce and in good demand. Prices remain as follows: Broken, $4.25; egg, stove and chestnut, $4.50; pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50; all f.o.b. New York harbor shipping points.

Bituminous

The Atlantic seaboard soft-coal trade continues weak; outside of contract business there is little doing and there seem to be several lots of coal standing in cars at tidewater which are urged for sale, depressing the market accordingly. Inasmuch as these lots have been offered and re-offered in several directions, the quantity seems to be magnified and gives the impression that there is a large surplus. This has called a halt on shipments of a number of companies until the situation has cleared.

Trade in the far East is fairly active on contract business. There seem to be orders in the hands of shippers at the lower ports for considerable coal. There are few vessels at this moment at these ports, but good weather is expected to change this condition. Trade along the Sound is quiet, with some of the cheaper coals being taken on in this region, but with no great avidity.

New York harbor trade is quiet, with little or no demand. Good steam coal is offered at $2.55 f.o.b. New York harbor shipping ports; some ¾-in. gas coal has been offered at $2.45 and for slack $2.40 has been asked, but at these low prices considerable has been withdrawn from the market.

Transportation from mines to tide is fairly good. Car supply is generally up to demand. Vessels in the coastwise trade are in poor supply and chartering is principally "to arrive." Freights seem to maintain themselves, although expected to drop with good weather. We quote current rates from Philadelphia to Boston, Salem and Portland, $1.25 and discharge; to Lynn, Newburyport, Portsmouth, Saco, Gardiner, $1.25; to Bath, $1.15; to Bangor, $1.30; to the Sound, $1; loading and discharging clause included, where usual.

Birmingham

April 22—Coal operations in Alabama are uninterrupted, the railroads supplying almost all the cars needed. The weather has not been warm as yet. Mine operators do not apprehend any falling off in demand during the summer.

Coke production in southern territory is improving right along, and greater advances are in sight. The Southern Steel Company has let a contract to the Oak Hill Marble Company, in Birmingham, to erect a number of coke ovens in Tennessee and Alabama. The Sayre Mining and Manufacturing Company is making preparations to erect a large battery of ovens at its mines during this year. The coke production in Alabama during the year 1906 went to 2,939,090 tons.

Chicago

April 22—Sales of coal, both bituminous and anthracite, continue fair, under the stimulus of unusually cold weather. The western mines are active and there is little demurrage coal to cut down prices. Contract making continues slow. The demand for steam coal is and probably will continue all summer large, but market prices probably will continue low.

Illinois and Indiana fine coals and run-of-mine are the staple of the market, run-of-mine selling for $1.70@2.25 and screenings bringing $1.40@1.60. Lump and egg from western mines are weakening, though stronger than usual at this season, and bring $2@2.50.

Eastern coals are generally well regulated as to supply. There is hardly any demurrage coal on tracks. Hocking sells for $3.15 for 1¼-in. lump; Pittsburg for $3@3.15 for 1¼-in. No. 8; Youghiogheny for $3.15 for ¾-in. Smokeless holds up firmly to circular prices of $3.35 for run-of-mine and $3.65 for egg and lump.

Anthracite business is improving, with the result that April probably will see an unusually large tonnage placed.

Cleveland

April 23—Indications now are that the receipts of iron ore at Cleveland, as well as the other Lake Erie ports, will be delayed at least another week, by which time the docks will be well cleared of their stocks on hand. Owing to the ice blockade at the Sault Ste. Marie and the frozen condition of the ore at Escanaba, the only ore-loading port on Lake Michigan, many owners intend having their boats take up the second cargo of coal, before carrying any ore. This will cause an exceptionally heavy movement of coal to Lake Michigan.

The market in coke is especially quiet; prices are not firm, and have a tendency

to ease off. Furnace coke for the remainder of the year is quoted at $2.75; foundry, $3.35@3.40 at ovens.

Indianapolis

April 20—The mining of coal is moving along slowly, and mine-owners are somewhat discouraged. A week ago the demand was quite brisk; especially were the orders for lake shipment encouraging, but the demand did not continue. Operators say they were mistaken in the estimate of the amount of coal needed to supply the early navigation market. For a few days the more prominent mines were run full time, but now they are shut down from one to two days out of the week. There is a good demand for steam coal and the mines have been cleaned up pretty well of all surplus of that kind.

Pittsburg

April 23—The production of coal in this district during the week was greater than at any time in the year and every effort is being made to keep the mines going steadily. There is a good supply of railroad cars and if the railroads continue as they have been lately, no difficulty will be experienced by the large lake shippers in breaking the record of last year. The rivers were navigable for a couple of days last week and about 3,000,000 bushels of coal were sent to lower ports. The prices continue good, the minimum being on the basis of $1.20 a ton for mine-run coal at mine. The introduction of the Pate dump at a number of the mines has caused dissatisfaction among the miners who contend that by this method coal is broken more than by the ordinary method of dumping the cars. The question was referred to a committee of two operators and two miners. They have held a number of sessions but could not come to an agreement and it may be necessary to call in a fifth person to decide.

Connellsville Coke—There has been a further decline in prices of prompt coke. Furnace coke is quoted at $2.65@2.70 and foundry at $3.40@3.50. It is said that these prices have been shaded in some instances. For delivery in the last half prices range from 15 to 20c. a ton higher. The *Courier* in its summary for the week gives the production in the Connellsville region at 285,193 tons and in the lower region at 130,107 tons. The shipments aggregated 14,208 cars, distributed as follows: To Pittsburg, 4848 cars; to points west of Connellsville, 8456 cars; to points east of Connellsville, 904 cars.

Foreign Coal Trade

April 24—Exports of fuel from Great Britain, with coal shipped for the use of steamers in foreign trade, for the three months ending March 31, are reported as follows, in long tons:

	1906.	1907.	Changes.
Coal	12,552,914	13,731,487	I. 1,178,573
Coke	174,456	238,033	I. 63,577
Briquets	357,426	344,744	D. 12,682
Total exports	13,084,796	14,314,264	I. 1,229,468
Steamer coal	4,544,419	4,424,009	D. 120,410
Total	17,629,215	18,738,273	I. 1,109,058

The total increase was 6.3 per cent. The shipments of coal to the United States for the three months were as follows:

	1906.	1907.	Changes.
Atlantic ports	19,116	7,113	D. 12,003
Pacific ports	....	6,005	I. 6,005
Total	19,116	13,118	D. 5,998

Among the larger shipments this year were to France, 2,756,142; Italy, 1,938,634; Germany, 1,670,260 tons.

Iron Trade Review

New York, April 24—The recent feeling of hesitation seems to be passing away; or else buyers have made up their minds that there is no use in waiting for recessions in price. There is still talk of withholding railroad orders, but much of this is for effect; though it is true that some improvements have been postponed, owing to difficulties in financing them.

In pig iron there has been a good deal of demand for short deliveries, some of it from concerns which have provided for later dates, but now find themselves short on current requirements. Some of these demands are being filled by imported pig.

In finished material there has been comparative quiet, though some requirements for structural steel are coming forward.

The inclement weather has postponed the opening of Lake navigation, and it is not likely that ore will begin to come down before May.

Baltimore

April 23—Imports of spiegeleisen for the week were 1015 tons; of ferromanganese, 557 tons. Receipts of iron ore were 5122 tons from Beni-saf, and 4800 tons from Cuba; 9922 tons in all.

Included in the exports were 2794 tons rails, 103 tons splice-bars and 125,400 lb. spikes to Dalny, Manchuria.

Birmingham

April 22—Iron for delivery during the third quarter in the southern territory is hard to get now, and one broker announces that he has been unable to place an order for 8000 tons at $18.50 for No. 2 foundry. Fourth quarter iron is selling right along and there are inquiries for 1908 iron with some sales. The transportation facilities are good; iron and cast-iron pipe are moving off rapidly. The production in Alabama is still off. During the past week the Alabama Consolidated Coal and Iron Company had bad luck at Gadsden furnace, some steam pipes exploding, and several days' time was lost. The Shelby Iron Company has blown in a furnace at Shelby, making two furnaces in operation, one on charcoal and the other on coke. The Woodstock Iron Company, at Anniston, is preparing to start up a furnace soon. Raw material for the blast iron furnaces is easier.

Iron quotations are firm, even fourth-quarter iron bringing $19 per ton, No. 2 foundry.

The steel production is holding up well. The Tennessee Coal, Iron and Railroad Company has had a number of inquiries for steel and rails for delivery during the coming year. The announcement of sales of rails for next year's delivery is not denied here.

Cleveland

April 23—Considerable interest is manifest in the market for foundry iron, owing to the recent heavy sales of steel-making iron, and a fair tonnage for last-half delivery has been sold. The Valley price for No. 2 foundry is $22, and at Cleveland furnaces for local consumption $22.50. The going Valley price on basic is $21. The following prices are quoted here: Bessemer, $21.85; No. 1 foundry, $23; No. 2 foundry, $22.50; No. 3 foundry, $22; No. 2 Southern, $22.85; gray forge, $21 per ton.

Chicago

April 22—Sales of pig iron continue quiet, but the market has a firm tone. Contracts for second-half supplies are becoming larger, and there is a steady demand for quick-delivery shipments, in lots not large individually, but in the aggregate. On such lots Northern brings about $26.50 and Southern $25.85@26.35 Chicago or $21.50@22 Birmingham.

On second-half contracts Southern is quoted at $18.50@19.50 Birmingham, depending on the delivery. Northern for second-half deliveries is in very good demand at about $24.50. There is considerable foreign iron in the local market selling well at $28@28.50 for early delivery.

Coke is in fair demand, with the supply ample. Connellsville 72-hour brings a little less than last week, the price being $6.15 on most sales.

Philadelphia

April 24—The feature of the week in pig iron has been the increase in demand for small lots by small consumers for forge, foundry, and in some instances, malleable irons. Quite a number of orders have been placed with our brokers for foreign irons, both Scotch and Middlesboro. Brokers intimate today that the situation of domestic iron will lead to larger imports during the last half of the year, or, at least, for consumption during that time. Few consumers have much

iron, and they appear to show indifference as to consequences. Quotations vary according to date of delivery. Forge iron is held at $23 for the best brands; No. 2 X, $25; Middlesboro, $22. For later deliveries quotations are in the neighborhood of $1 less.

Steel Billets—The billet market is in an excited condition over rumors of changes in prices, which cannot be traced to any authoritative source. Quotations are given at $32 for billets, and $37@39 for forging steel.

Bars—For prompt shipment premium prices are the rule.

Pipes and Tubes—Pipes and tubes are exceptionally active. Premium prices are the rule.

Structural Material—A great deal of new work is coming to the surface, involving the construction of big buildings in and near the city.

Rails—The interest in the rail market is directed to the placing of orders for 1908 delivery. All of the mills have some little crevices for delivery this year, but they are guarding them very closely.

Scrap—Some kinds of scrap are very scarce, and consequently high. The advances refer particularly to steel scrap and crop-ends. Railroad scrap is practically out of the market at present, and is held at $21. Machinery scrap can be picked up at about $21 to $21.25; old iron rails are quoted nominally at $27 per ton.

Pittsburg

April 23—New business booked in nearly every line of finished products is equal to production. It is evident today that it will be impossible to fill all orders this year and that a heavy tonnage will go over into 1908. There is not an idle plant in this district. Among the more congested of the finished lines are sheets, tin-plate, pipe and plates. The American Sheet and Tin Plate Company last week started four of the eight new mills at the Vandergrift sheet plant, and the other four will be in operation before the end of the month, making a total of 172 sheet mills, all in operation. The company last week put the Morewood works, an eight-mill tin-plate plant at Gas City, Ind., in operation and is now running 235 of its 248 tin-plate mills. The idle plants are Humbert at Connellsville, Penn., 6 mills, and Anderson at Anderson, Ind., 7 mills; they would be running but for the scarcity of steel. Steel bars continue strong, 1.60c. being the absolute minimum for any delivery this year. One of the features of the week was a contract with an agricultural implement interest for its entire requirements for a year beginning July 1, at that price.

The United States Steel Corporation and other steel-rail makers in the North have opened their order books for 1908, continuing the price of $28 at mill which has been in force since April, 1901. The Tennessee Coal, Iron and Railroad Company opened its books about two weeks ago, establishing a price of $30 for open-hearth steel rails, and it has booked an order from the Louisville & Nashville Railroad for 46,000 tons for 1908. The Bethlehem Steel Company will be a producer of open-hearth rails about July, and has some orders on its books. The price, it is understood, will be $30 at mill. According to plans which are to be developed before the end of the year, the Ohio works of the Carnegie Steel Company will be making open-hearth rails in January and it is probable the new steel plant at Gary also will be running on open-hearth rails about that time. Orders for standard bessemer rails continue to come in and the Carnegie mills are nearly sold up for deliveries this year. The Carnegie rail production for 1907 will be about 1,100,000 tons.

Pig Iron—A number of large and important sales of pig iron have been closed this week, all deliveries being for the second half and at from $1 to $1.50 above the highest price yet paid for that delivery. Some of the transactions have not been made public, and it is understood that two large independent steel interests have entered the market. Sales announced today include 3000 tons for second half at $22.50, 3000 tons for third quarter, 12,000 tons for second half and 8000 tons for fourth quarter, all at $22 f.o.b. Valley furnaces. There is likely to be a further advance in prices of bessemer iron. Inquiries are heavy and, it is estimated, amount to 75,000 tons. There is no iron for second-quarter delivery and there would be no difficulty in getting $24 for bessemer and $25 for No. 2 foundry. Gray forge is stronger and a sale of 2000 tons is recorded at $21.85, Pittsburg.

Steel—Steel continues scarce and bessemer billets are held firmly at $30.50, Pittsburg. Open-hearth billets cannot be had at any price. Sheet-bars command $30 on long time contracts, but for prompt shipment are held at $31. Tank plate remains at 1.70c. and steel bars at 1.60c.

Sheets—New business is being booked daily and the mills are still about six months behind on deliveries. Black sheets are held at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—There has been a further decline and quotations for prompt delivery are $71@72 per ton.

Cartagena, Spain

April 6—Messrs. Barrington & Holt report shipments of iron ore for the week: 23,550 tons to Great Britain; 13,170 tons to Rotterdam; 1000 tons to Baltimore; 37,720 tons in all.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Pyrites—The quotation for iron pyrites, 40 per cent. iron and 43 sulphur, is 11s. 9d. per ton, f.o.b. shipping port.

London

April 15—Exports of iron and steel, and of machinery, from Great Britain for the three months ended March 31 are valued by the Board of Trade returns as follows:

	1906.	1907.	Changes
Iron and Steel..	£ 9,076,854	£11,363,080	I. £2,286,226
Machinery.....	6,193,379	7,007,486	I. 814,107
New Ships.....	1,422,672	2,151,298	I. 728,626
Total.....	£16,692,905	£20,521,864	I. £3,829,959

The total increase was 22.9 per cent. The leading items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	285,942	483,069	I. 197,127
Wrought iron.....	44,338	52,951	I. 8,613
Rails	100,919	101,559	I. 640
Plates.....	56,291	85,441	I. 29,150
Sheets.....	116,234	128,253	I. 12,019
Steel shapes, etc....	43,666	58,969	I. 15,303
Tin-plates.....	91,771	101,332	I. 9,561

The total quantities of iron and steel were 992,411 tons in 1906, and 1,268,135 tons in 1907; an increase of 275,724 ons. Exports of pig iron to the United States this year were 180,273 tons, an increase of 125,189 tons; of tin-plates, 16,019 tons, an increase of 5146 tons.

Imports of iron and steel and of machinery into Great Britain for the three months were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£2,485,288	£1,607,489	D. £877,799
Machinery.....	1,242,334	1,203,243	D. 39,091
Total.....	£3,727,622	£2,810,732	D. £ 916,890

The total decrease was 24.6 per cent. The chief items of the imports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	21,071	21,650	I. 576
Wrought iron.....	36,811	15,634	D. 21,177
Steel billets, etc.....	164,268	69,845	D. 94,423
Bars and shapes.....	17,872	2,928	D. 14,944
Structural steel.....	42,701	21,486	D. 21,215

The total quantities of iron and steel were 385,930 tons in 1906, and 205,379 tons in 1907; a decrease of 180,551 tons, or 46.7 per cent.

Imports of iron ores into Great Britain for the three months were, in long tons:

	1906.	1907.	Changes.
Manganiferous ores.	98,891	99,396	I. 505
Iron ores.....	1,960,488	1,899,188	D. 61,300
Total.	2,059,379	1,998,584	D. 60,795

Of the ores imported this year 72,930 tons of manganiferous and 1,482,749 tons of iron ores came from Spain.

Dusseldorf, Germany

April 15—The exports of iron and steel, and of machinery from Germany for the two months ended Feb. 28 were, in metric tons:

	1906.	1907.	Changes.
Iron and steel.....	721,339	522,830	D. 198,509
Machinery.....	68,804	48,036	D. 20,768
Total.....	790,143	570,866	D. 219,277

The total decrease was 27.7 per cent. The imports for the three months were:

	1906.	1907.	Changes.
Iron and steel	66,477	88,225	I. 21,748
Machinery	21,565	8,678	D. 12,887
Total	88,042	96,903	I. 8,861

The increase shown in the total was 10.1 per cent.

The estimated consumption of pig iron in Germany in 1906 was as follows, in metric tons:

Pig iron production	12,478,067
Imported as pig iron	497,240
Pig iron equivalent of steel, etc., imported	384,100
Total supplies	13,359,407
Pig iron exported	613,527
Pig iron equivalent of steel, etc., exported	4,467,041
Total deductions	5,080,568
Approximate consumption	8,278,839

The estimated consumption was 134.96 kg., and the production of pig iron 203.43 kg. per inhabitant of the German Empire.

Paris, France

April 6—The preliminary statement of iron production in France for the year gives the output of pig iron as below, in metric tons:

	1905.	1906.	Changes
Foundry iron	635,672	591,275	D. 44,397
Forge iron	705,691	741,571	I. 35,880
Bessemer pig	160,411	149,971	D. 10,440
Basic pig	1,530,671	1,784,726	I. 254,055
Special irons	44,267	51,489	I. 7,222
Total	3,076,712	3,319,032	I. 242,320

The total increase was 7.9 per cent., nearly all of it being in basic pig. The production of wrought iron and steel was as follows, in metric tons; no division of the steel by processes is given:

	1906.	1907.	Changes
Wrought iron	669,841	736,918	I. 67,077
Steel ingots	2,210,284	2,371,377	I. 161,093
Finished steel	1,442,071	1,454,456	I. 12,385

The increase in wrought iron was 10.1 per cent.; in steel ingots, 7.3; in finished steel, 6.9 per cent. Of the wrought iron in 1906, sheets were 90,351 tons; bars and merchant iron, 646,567 tons. The finished steel reported in 1906 was: Castings, 30,878; forgings, 30,715; sheets and plates, 294,714; rails, 338,407; merchant and structural steel, 759,742 tons. The ratio of steel to pig-iron production was 71.4 last year.

New Caledonia

Mineral exports for the full year are given by the *Bulletin du Commerce* of Noumea as follows, in metric tons:

	1905.	1906.	Changes.
Nickel ore	125,289	130,688	I. 5,399
Cobalt ore	7,919	2,487	D. 5,432
Chrome ore	51,374	57,367	I. 5,993
Copper ore	.....	207	I. 207
Iron ore	.....	3	I. 3
Magnesite	11	.....	D. 11

The exports for 1906 included 451 tons nickel ore and 23,338 tons chrome ore to the United States.

Metal Market

NEW YORK, April 24

Gold and Silver Exports and Imports

At all United States Ports in March and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1907	$2,126,173	$ 5,007,319	Imp. $2,881,146
" 1906	5,918,627	5,630,695	Exp. 287,932
Year 1907	5,703,304	11,607,691	Imp. 5,904,387
" 1906	20,146,622	10,316,087	Exp. 9,830,535
Silver:			
Mar. 1907	5,058,461	3,936,139	Exp. 1,122,322
" 1906	5,213,811	3,509,838	" 1,703,973
Year 1907	14,669,396	11,315,168	" 3,354,228
" 1906	19,165,608	12,676,998	" 6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Apr. 20 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 3,000	$ 147,062	$ 691,660	$ 7,907
1907	1,759,336	5,185,847	11,539,079	642,989
1906	3,674,526	4,845,489	21,207,628	603,818
1905	32,440,807	4,486,176	10,382,749	1,136,984

Exports of gold for the week were to Mexico; of silver, to London and Haiti. Imports of gold for the week were from Great Britain and the West Indies; of silver, from Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending April 20 shows loans $1,125,000,900, an increase of $107,575,900; deposits, $1,108,063,500, an increase of $100,699,200, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie	$189,653,600	$215,129,400
Legal tenders	78,579,200	73,616,300
Total cash	$268,232,800	$288,745,700
Surplus	$16,366,725	$ 11,704,925

The surplus over legal requirements shows a decrease of $4,661,900, as compared with the previous week this year.

Specie holdings of the leading banks of the world, April 20, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$215,129,400
England	$179,474,480	.....	179,474,480
France	513,737,365	$196,107,020	709,844,385
Germany	165,755,000	55,250,000	221,005,000
Spain	77,275,000	125,740,000	203,015,000
Netherlands	25,776,000	28,077,500	53,853,000
Belgium	16,176,665	8,088,335	24,265,000
Italy	161,675,000	25,486,000	187,161,000
Russia	597,635,000	29,440,000	627,075,000
Aust.-Hungary	227,300,000	62,290,000	289,590,000
Sweden	20,760,000	.....	20,760,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to April 11:

	1906.	1907.	Changes.
India	£ 5,648,978	£4,149,408	D. £ 1,499,570
China	.....	.....	.....
Straits	.....	204,050	I. 204,050
Total	£ 5,648,978	£4,353,458	D. £ 1,295,520

Imports for the week were £93,000 in bars and £55,000 in Mexican dollars from New York; a total of £148,000. Exports were £31,500 in coin to the Straits; £80,850 in bars and £25,000 in Mexican dollars to India; £137,350 in all.

Indian exchange remains steady; the Council bills offered in London were all taken at an average of 16.09d. per rupee, though the amount offered was increased from 50 to 70 lakhs of rupees.

The gold and silver movement in Great Britain for the three months ended March 31 is reported as follows:

Gold:	1906.	1907.
Imports	£13,309,701	£12,701,421
Exports	6,956,576	9,049,181
Excess, imports	£ 6,353,125	£ 3,651,240
Silver:		
Imports	£ 6,008,619	£ 5,089,195
Exports	6,155,553	5,390,084
Excess, exports	£ 146,934	£ 300,889

Of the silver imported this year, £3,210,566, or 63.1 per cent. of the total, was from the United States.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.50¾	$0.52¾
Peruvian soles and Chilean	0.46	0.49
Victoria sovereigns	4.85	4.87
Twenty francs	3.85	3.89
Spanish 25 pesetas	4.78½	4.80

SILVER AND STERLING EXCHANGE.

April.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	April.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
18	4.85½	65⅛	30 5/16	22	4.85¾	65⅛	30¼
19	4.85½	65⅛	30¼	23	4.85¼	65⅛	30¼
20	4.85¾	65⅛	30 5/16	24	4.86¼	65¾	30 5/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

April.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
18	25 @25½	24 @24¼	98¼	40⅛	6.00	6.65	6.50
19	25 @25½	24 @24¼	99⅜	40¾	6.00	6.65	6.50
20	25 @25½	24 @24¼	.....	41	6.00	6.65	6.50
22	25 @25½	24 @24¼	99⅞	41¼	6.00	6.65	6.50
23	25 @25½	24 @24¼	99 11/16	41⅛	6.00	6.65	6.50
24	25 @25½	24 @24¼	101	41¾	6.00	6.65	6.50

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—The general character of the market remains entirely unchanged. The situation is discussed more fully elsewhere in this issue. The disparity between domestic and European prices is still material, but has decreased somewhat since last week, owing to an advance abroad. Some business has been reported from day to day, largely for export, at the ruling quotations, as given below, but the total volume has shown no increase over the previous week, and the movement toward a stronger market that was then noted has failed to go further. The great disparity in the domestic market between the prices for Lake and electrolytic, and electrolytic and casting continues.

Some comment has been excited by the fact that bids of 25c. for Lake copper and 24¼c. for electrolytic were made on the Metal Exchange this week without leading to business. Of course, this is quite without significance, inasmuch as the Metal Exchange has not been anything but a statistical bureau for a long time, there being no transactions in copper upon it, and no representatives of the selling agencies present. If the bidder had applied to first hands for the copper wanted he would have been accommodated.

We quote prices unchanged at 25@25½c., for Lake; 24@24¼c., for electrolytic; and 22½@23c., for casting.

There is quite a scarcity of standard copper in the London market, doubtless due in a measure to the drafts which have been made upon the supply for the purpose of refining the material in the United States. Prices have been gradually working up, and the close is quoted strong at £101 for spot, £100 15s. for three months'.

Refined and manufactured sorts we quote: English tough, £108@109; best selected, £109@110; strong sheets, £118.

In our last issue John R. Stanton was named as a member of the committee on copper of the New York Metal Exchange, We are informed that the position was offered to Mr. Stanton, but he declined to serve, and is not a member of the committee.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—It is generally understood that consumers here have allowed their supplies to run down to a minimum, and foreign operators appear to take advantage of this fact by advancing the London quotation from day to day. The closing is cabled at £189 15s. for spot, £188 10s. for three months.

Domestic buyers who have missed the opportunity are slow to follow the advance, and continue to buy only against their immediate requirements. The quotation at the close is 41¾c.

Lead—The price for desilverized remains unchanged at 6c. per lb., New York; 5.92½c., St. Louis. In each market corroding brands sell for 10c. per 100 lb. higher. The premium which has been obtained for some time past on the small quantities of lead for immediate delivery offered by dealers has now practically disappeared.

The higher prices in London have been well sustained throughout the week and the close is steady at £20 for Spanish lead, £20 2s. 6d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull but steady, at 5.92½c. for Missouri brands.

Spelter—The demand is altogether of a hand-to-mouth character and buyers are inclined to await developments before covering their requirements for future shipment. The market closed nominal at 6.65 New York, 6.50c. St. Louis.

The London market has shown a somewhat better tone, and at the close prices are higher at £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market continues dull, with quotations nominally at 24c. for Cookson's, 20½@21c. for Hallett's, and 20@21c. for ordinaries; a decline from last week.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $32@32.50 per ounce for ordinary metal; $35 for hard. Scrap is quoted at $25 per ounce.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

British Metal Imports and Exports

Copper—Imports and exports of copper in Great Britain for the three months ending March 31 were as follows, in long tons; the totals giving the copper contents of all material:

	1906.	1907.	Changes.
Copper ore	24,868	23,476	D. 1,392
Matte and precipitate	19,348	18,153	D. 1,195
Fine copper	18,800	18,564	D. 236
Total imp. fine copper	30,961	29,989	D. 972
Exports	11,532	13,067	I. 1,535
Re-exports	5,857	6,982	I. 1,125
Total exports	17,389	20,049	I. 2,660
Balance, imports	13,572	9,940	D. 3,632

Of the imports this year the United States furnished 61 tons of matte and 6687 tons fine copper; against 1051 and 5824 tons, respectively, last year.

Tin—Imports and exports of tin in Great Britain for the three months ending March 31 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	9,172	8,249	D. 923
Australia	1,189	1,469	I. 280
Other countries	633	1,089	I. 456
Total imports	10,994	10,807	D. 187
Re-exports	8,342	7,011	D. 1,331
Exports	1,789	2,394	I. 605
Total exports	10,131	9,405	D. 726
Balance, imp	863	1,402	I. 539

Imports of tin ore were 4319 tons in 1906, and 4557 tons in 1907; an increase of 238 tons. Of the imports this year 3873 tons were from Bolivia.

Lead—Imports and exports of lead in Great Britain for the three months ending March 31 were as follows, in long tons:

	1906.	1907.	Changes.
United States	4,294	3,249	D. 1,045
Spain	25,111	25,965	I. 854
Australia	13,357	13,484	I. 127
Germany	3,728	2,722	D. 1,006
Other countries	860	1,566	I. 706
Total imports	47,350	46,986	D. 364
Exports	11,146	13,389	I. 2,243
Balance, imports	36,204	32,597	D. 2,607

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the three months ended March 31 were, in long tons:

	1906.	1907.	Changes.
Spelter	24,652	22,681	D. 1,971
Zinc sheets, etc	4,158	5,508	I. 1,350
Total imports	28,810	28,189	D. 621
Exports	1,665	1,374	D. 291
Balance, imports	27,145	26,815	D. 330

Imports of zinc ores are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the three months ended March 31 were 426,882 lb. in 1906, and 1,191,007 lb. in 1907; an increase of 764,125 lb. Re-exports were 629,251 lb. in 1906, and 767,362 lb. in 1907; an increase of 138,111 lb. this year.

Missouri Ore Market

Joplin, Mo., April 20—The highest price paid for zinc was $52 per ton, on an assay base price ranging from $47 to $50 per ton of 60 per cent. zinc. The average price was $48.74. The highest price paid for lead was $82 per ton, medium grades selling from $77 to $79. The average was $79.40 per ton.

With new mills ready to start it is found impossible to find experienced men to operate them, but the greater demand is for more ground men on the machines and for shoveling. Since the last deportation of miners to the West, this scarcity is lowering the output. Competition for experienced workmen has advanced wages to a high point.

Following are the shipments of zinc and lead for the week ending April 20:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	2,898,970	767,580	$103,177
Joplin	2,752,160	475,620	86,451
Galena-Empire	1,369,100	295,040	45,344
Alba-Neck City	1,124,420	....	28,673
Duenweg	754,220	154,980	25,079
Badger	891,830	2,780	23,298
Spurgeon-Spring City.	568,030	81,940	15,046
Oronogo	493,110	67,690	13,792
Aurora	511,000	.....	12,264
Granby	335,000	60,000	7,550
Prosperity	218,180	40,310	7,066
Baxter Springs	125,800	.....	3,050
Carl Junction	65,260	16,960	2,245
Stott City	64,340	.....	1,576
Playter	52,680	.....	1,291
Zincite	35,880	.....	897
Totals	12,259,980	1,962,900	$376,799
16 weeks	192,756,120	29,881,820	$5,800,907

Zinc value, the week, $298,855; 16 weeks, $4,564,898
Lead value, the week, 77,944; 16 weeks, 1,236,009

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	.....	April	75.13	.....
May	40.51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September.	42.58	.....	September.	79.64	.....
October	41.55	.....	October	79.84	.....
November.	44.13	.....	November.	81.98	.....
December.	43.68	.....	December.	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., April 20—The greater part of the 60 per cent. zinc ore was sold at $50, no change from last week. The official report of the week shows considerable increase in the amount mined as well as that shipped. Very little has been done in regard to relieving the shortage of cars, but much is promised. Lead is steady and in good demand. Drybone and sulphur sold at a little above last week's prices.

The shipment for the district, by camps, for the week ending April 20, was as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena	79,700	.....	.....
Buncombe-Hazel Green.	453,500	.....	.....
Benton	158,700	.....	.....
Cuba City	214,335	.....	.....
Platteville	483,000	.....	...
Rewey	62,900	56,000	.....
Livingston	113,000	.....	.....
Mineral Point	54,000	.....	.....
Harker	123,670	.....	.....
Linden	473,610	.....	.....
Highland	333,700	41,800	.....
Total for week	2,550,115	97,800	.....
Year to April 20	27,584,594	1,229,990	143,160

All of the ore produced was sold, but not all of it was loaded.

Chemicals

New York, April 24—There is no special change in the chemical trade, business remaining good.

Copper Sulphate—Trade is active and prices firm. We continue to quote $7.50 per 100 lb. for carload lots, or over; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The demand continues good. Spot prices are $2.70 per 100 lb., with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. is $2.45, for both 1907 and 1908.

Sulphur—Messrs. Emil Fog & Sons report from Messina, Sicily, under date of April 1: We doubt whether it will be possible to report anything new, until the definitive board of directors has been appointed, an event which will probably be delayed until June. Prices remain unaltered. The Consorzio has now settled with the proprietors of the mines for their first deliveries of brimstone, paying them in full, except the deduction of a small quota for expenses. The Bank of Sicily has been authorized by law to issue another 10,000,000 lire of paper in aid of the sulphur industry, and considering this plentiful supply of money, we see no prospect of lower prices in the near future. Although it has been reported that American brimstone was offered in Europe, we can hardly believe this to be true, as otherwise the Consorzio would not refuse permission to export to the United States. As it is, it will not even allow shipment to Canada, so that we must presume that the agreement with Mr. Frasch, which we believe to exist, if not on paper, at least, in a tacit form, has not been encroached on. Of course, no terms have been divulged by the Consorzio.

Exports of sulphur from Sicily for the two months ending Feb. 28 were, in the tons of 1030 kg. usual in the trade:

	1906.	1907.	Changes.
Exports, two months	64,378	54,545	D. 9,833
Stock, March 1	447,282	533,921	I. 86,639

The exports to the United States, included above, were 10,885 tons in 1906, and 76 tons in 1907; a decrease of 10,809 tons.

British Chemical Trade—Exports of chemicals from Great Britain for the three months ended March 31, were as follows, in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	250,734	271,116	I. 20,382
Muriate of ammonia,	27,592	40,798	I. 13,206
Soda ash	363,059	504,048	I. 140,989
Bicarbonate of soda.	73,275	100,444	I. 27,169
Caustic soda	355,628	374,238	I. 18,610
Soda crystals	35,404	29,981	D. 5,423
Soda sulphate	180,286	199,103	I. 18,817
Sulphuric acid	28,827	22,772	D. 6,055

Exports of copper sulphate were 17,106 long tons in 1906, and 19,267 tons in 1907; an increase of 2161 tons.

Imports of chemicals and raw materials into Great Britain for the three months ended March 31, were, in long tons:

	1906.	1907.	Changes.
Nitrate of potash	2,622	3,186	I. 564
Nitrate of soda	23,273	39,039	I. 15,766
Phosphates	129,270	150,345	I. 21,075
Sulphur	6,007	4,535	D. 1,472
Pyrites	209,704	199,802	D. 9,902

Estimating sulphur contents of pyrites, the total imports of sulphur were 90,889 tons in 1906, and 84,456 tons in 1907; a decrease of 6433 tons.

Mining Stocks

New York, April 24—The general stock markets have shown rather more activity, chiefly because low rates for money have been the rule. Trading, however, is still of the professional order to a great extent, and the public interest, apparently, is not great. On the curb market the copper stocks were in fair demand, with slight advances in price here and there, but with no special incidents.

One sale of Homestake, of South Dakota, was reported, 100 shares changing hands at $75 per share. This is a fall of $9.50 per share from the latest reported sale.

Considerable business is developing in the new mining stock department of the Produce Exchange. The number of stocks listed is gradually increasing, and there is more interest taken in the calls. This business, apparently, is coming chiefly from the curb market.

Boston

April 23—It has been a week of ups and downs in mining shares in this market, but the main characteristic has been dullness. True, prices are higher than they were a week back and the monetary situation is greatly improved, but there is a lack of interest and the buying power is almost negative. President Bigelow is still on deck with his suits against the Calumet & Hecla, which is a damper on the situation, although it must be said that they have not as yet created any havoc in mining circles. The latest suit is as a Calumet & Hecla stockholder. Calumet & Hecla stock is up $25 for the week to $845 and Osceola $5 to $140. Quincy has advanced $5 to $123 and Wolverine $10 to $160. Copper Range closes a trifle above a week back at $81.50. The suit of this company against A. C. Burrage and T. W. Lawson to recover $3,000,000 damages or the restoration of 70,000 shares of Copper Range Consolidated, which were exchanged for Trimountain mining stock, is now being tried in the Supreme Court, but it is without effect in the market.

Amalgamated has advanced $4 in the week to $97.25, with the final tonight a trifle below this. No disappointment is felt because an increase was not made in the dividend, as none was generally expected.

Davis Daly and Nipissing have been the curb features. The former recorded an advance from $12.50 to $17, with reaction to below $16. The latter is up $1.75 to $14.75 per share.

Colorado Springs

April 17—The trading on the local stock exchange has been more active than for several weeks. Prices have not advanced materially, but there is a feeling among the brokers generally that the bottom has been reached, and that the whole market will show a decided advance before another 30 days. The market was particularly active today and 95,000 shares changed hands, about half being in the mines' list.

STOCK QUOTATIONS

NEW YORK Apr. 23	
Name of Comp.	Clg.
Alaska Mine	1⅛
Am.Nev.M.&P.Co.	3⅛
Amalgamated	97⅛
Anaconda	63
Balaklala	10
British Col. Cop.	7⅞
Buffalo Cobalt	3 1/16
Butte & London	2
Butte Coalition*	27¼
Butte Cop. & Zinc	5¾
Cobalt Contact	⅝
Colonial Silver	3
Cum. Ely Mining	8¾
Davis Daly	15½
Dominion Cop	5⅞
El Rayo	5¾
Foster Cobalt	1⅜
Furnace Creek	1⅛
Giroux Mine	9⅛
Gold Hill	1¾
Granby, New	15
Greene Gold	1⅝
Greene G. & S	1¾
Greenw'r & D.Val.	
Guanajuato	¼
Guggen. Exp.	230
Hanapah	⅛
McKinley Dar.	1 1/16
Micmac	4⅜
Mines Co. of Am.	1⅝
Mitchell Mining	3⅜
Mont.Sho. C.(New)	10
Nev. Utah M. & S.	4⅛
Newhouse M. & S.	20
Nipissing Mines	14⅜
Old Hundred	3½
Silver Queen	1⅜
Stewart	2 7/16
Tennessee Copper	
Union Copper	⅜
Utah Apex	5¾
West Columbus	12

N. Y. INDUSTRIAL	
Am. Agri. Chem.	20
Am. Smelt. & Ref.	134⅛
Am. Sm. & Ref., pf.	108⅞
Bethlehem Steel	20
Colo. Fuel & Iron	36⅝
Federal M. & S., pf.	88
Inter. Salt	16
National Lead	63
National Lead, pf.	98½
Pittsburg Coal	12¼
Republic I. & S.	29¾
Republic I. & S., pf.	85⅝
Sloss-Sheffield	54
Standard Oil	517
Tenn. C. & I.	145⅜
U. S. Red. & Ref.	18
U. S. Steel	38
U. S. Steel, pf.	101⅝
Va. Car. Chem	28⅛
Va. I. Coal & Coke	73

ST. LOUIS Apr. 20		
N. of Com.	High.	Low.
Adams	.40	.25
Am. Nettie	.06	.04
Center Cr'k	2.15	2.00
Cent. C. & C.	66.00	65.00
C.C. & C. pd.	78.00	76.00
Cent. Oil	130.00	110.00
Columbia	5.00	4.50
Con. Coal	27.23	25.00
Doe Run	170.00	160.00
Gar. Bimet.	.30	.23
St. Joe	17.50	16.00

BOSTON Apr. 23	
Name of Comp.	Clg.
Adventure	3⅝
Allouez	
Am. Zinc	37½
Arcadian	6¾
Atlantic	14
Bingham	18¾
Boston Con.	29½
Calumet & Ariz.*	166
Calumet & Hecla*	845
Centennial	30
Con. Mercur	.38
Copper Range	81½
Daly-West	16
Franklin	17½
Greene—Can. ctfs.	16⅝
Isle Royal	19½
La Salle	17½
Mass	
Michigan	15
Mohawk	84
Mont. C. & C.(new)	2¾
Nevada	14
North Butte	86¼
Old Colony	
Old Dominion	54¼
Osceola	140
Parrot	22¾
Phoenix	
Quincy*	122
Rhode Island	5⅞
Santa Fe	3⅛
Shannon	17½
Tamarack*	108
Trinity	21½
United Cop., com.	61¾
U. S. Oil	10
U. S. Smg. & Ref.	54½
U.S.Sm.& Re.,pd.*	44
Utah Copper	62¾
Victoria	8
Washington	
Winona	
Wolverine	160
Wyandotte	1½

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	95
Ariz. Com	25
Black Mt	5⅞
Cananea Cent	
East Butte	10⅜
Hancock Con	9
Keweenaw	10
Majestic	3¼
Raven	1⅞
Shawmut	.75
Superior	
Superior & Pitts.	18⅜
Troy Man	2

LONDON Apr. 24	
Name of Com.	Clg.
Dolores	£1 12s 6d
Stratton'sInd.	0 3 3
Camp Bird	1 3 6
Esperanza	2 2 6
Tomboy	1 8 1½
El Oro	1 6 3
Oroville	0 16 10½
Somera	0 6 3
Utah Apex	1 6 3
Ariz.Cop.,pfd.	3 15 0
Ariz.Cop.,def.	3 12 6

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Apr. 18	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.55
Best & Belcher	1.35
Caledonia	.43
Challar	.20
Con. Cal. & Va	1.10
Crown Point	.29
Exchequer	.80
Gould & Curry	.39
Hale & Norcross	.90
Mexican	.98
Ophir	2.45
Overman	.16
Potosi	.12
Savage	.95
Sierra Nevada	.63
Union	.57
Utah	.05
Yellow Jacket	1.10
TONOPAH STOCKS	
Golden Anchor	.37
McNamara	.48
Montana-Pitts.ex.	...
North Star	.36
Rescue	.20
GOLDFI'D STOCKS	
Black Ants	.11
Blue Bull	.49
Columbia Mt	.95
Comb. Frac	4.65
Conquerer	.20
Daisy	2.15
Florence	5.00
Frances-Mohawk	1.10
Goldfield Con	8.12
Grandma	.21
Great Bend	1.05
Red Hills	.48
St. Ives	1.55
BULLFROG STOCKS	
Amethyst	.44
Bonnie Claire	.43
Mayflower Con	.43
Montgomery Mt.	.27
Original	.15
MANHAT'N STOCKS	
Gold Wedge	.11
Manhattan Mg	.13
Pine Nut	.16
Ruby Wonder	...
Stray Dog	.25
Yellow Horse	.05

NEVADA Apr. 24 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	18.00
Tonopah Exten.	3.50
Montana Tonop'h	3.62½
Belmont	4.75
Tonopah Midway	1.72
West End Con	1.30
Jim Butler	1.25
GOLDFI'D STOCKS	
Sandstorm	.80
Kendall	.47
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.45
Dia'dfield B. B. C.	.42
Atlanta	.79
Mohawk	16.00
Silver Pick.	1.30
Laguna	1.65
BULLFROG STOCKS	
Mont. Shoshone C.	10 00
Tramps Con	1.08
Gold Bar	1.15
Bullfrog Mining	.28
Bullfrog Nat. B	.39
Homestake Con	1.20
MANHAT'N STOCKS	
Manhattan Con	.72
Manhat'n Dexter	.22
Jumping Jack	.17
Stray Dog	.25
Indian Camp	.17

COLO. SPRINGS Apr. 20	
Name of Comp.	Clg.
Acacia	9
Black Bell	...
C. C. Con	5
Dante	5¼
Doctor Jack Pot	7
Elkton	55
El Paso	43¾
Findlay	65⅜
Gold Dollar	7¾
Gold Sovereign	6¾
Isabella	24
Index	....
Jennie Sample	7
Jerry Johnson	4
Mary McKinney	55
Pharmacist	6⅝
Portland	1.17
Un. Gold Mines	8¼
Vindicator	84
Work	16¾

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$3,061,758
Beck Tunnel, Utah	Apr.	0.04	40,000
Consolidation Coal	Apr. 30	1.50	153,750
Esperanza, Mex	Apr. 22	1.32	600,600
Grand Central, Utah	Apr.	0.10	25,000
Homestake, S. Dak	Apr. 25	0.50	109,200
Inter. Nickel, pfd	May 1	1.50	131,123
Mary McKinney, Colo	Apr. 25	0.03	39,128
Mines Co. of America	Apr. 26	0.02	40,000
New Central Coal, Md	May 1	0.40	20,000
Nipissing, Ont	Apr. 20	0.15	180,000
N. Y. & Hon. Rosario	Apr. 20	0.10	15,000
Penna. Steel, pfd	May 1	3.50	588,749
Philadelphia Co	May 1	0.75	434,296
Tenn. Coal, Iron & R.R	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd	May 1	2.00	4,960
Tonopah Co., Nev	Apr. 22	0.35	350,000
United Copper	Apr. 29	1.75½	787,500
United Zinc	Apr. 15	0.50	9,778
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U.S. C. I. Pipe & Fdy, pfd	June 1	1.75	262,500
Utah, Fish Springs	Apr.	0.03	3,000
Victoria, Utah	Apr.	0.04	10,000
Vindicator Con., Colo	Apr. 25	0.03	45,000
Vulcan Detinning, pfd	Apr. 20	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev	Mar. 25	Apr. 30	$0.10
Belcher, Nev	Apr. 16	May 9	0.15
Caledonia, Nev.	Apr. 10	May 1	0.10
Challar, Nev	Apr. 22	May 16	0.10
Confidence	Apr. 23	May 14	0.20
Con.St.Gothard,Cal.	Apr. 24	May 14	0.10
Gould & Curry, Nev.	Apr. 10	May 1	0.10
Hale & Norcross, N.	Apr. 3	Apr. 30	0.15
Lost Packer, Idaho	May 6	May 27	1.00
Lucky Dutch'n, Nev.	May 4	May 25	0.01
Morrison, Utah	Apr. 16	May 10	0.01
Seg. Belcher	Apr. 9	Apr. 29	0.05
Skylark, Utah	Apr. 9	Apr. 30	0.01
Union Con., Nev	Apr. 3	May 8	0.10
Utah & N. Y., Utah	Apr. 27	May 16	0.01
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	.....	29.984	.....
May	66.976	.....	30.968	.....
June	65.394	.....	30.185	.....
July	65.105	.....	30.113	.....
August	65.949	.....	30.529	.....
September	67.927	.....	31.483	.....
October	69.523	.....	32.148	.....
November	70.813	.....	32.671	.....
December	69.050	.....	32.003	.....
Year	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	.....	18.688	.....	84.793	.....
May	18.475	.....	18.724	.....	84.867	.....
June	18.442	.....	18.719	.....	83.994	.....
July	18.190	.....	18.585	.....	81.167	.....
August	18.380	.....	18.706	.....	83.864	.....
September	19.033	.....	19.328	.....	87.831	.....
October	21.203	.....	21.722	.....	97.269	.....
November	21.833	.....	22.398	.....	100.270	.....
December	22.885	.....	23.350	.....	105.226	.....
Year	19.278	.....	19.616	.....	87.282	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Montn.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	.....
February	36.403	42.102	August	40.606	.....
March	36.662	41.313	September	40.516	.....
April	38.900	.....	October	42.852	.....
May	43.313	.....	November	42.906	.....
June	39.260	.....	December	42.750	.....
			Av. year	39.819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.404	.....	15.959	.....
May	5.685	.....	16.725	.....
June	5.750	.....	16.813	.....
July	5.750	.....	16.525	.....
August	5.750	.....	17.109	.....
September	5.750	.....	18.266	.....
October	5.750	.....	19.350	.....
November	5.750	.....	19.281	.....
December	5.900	.....	19.609	.....
Year	5.657	.....	17.370	.....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	.....	5.931	.....	25.781	.....
May	5.997	.....	5.846	.....	27.000	.....
June	6.096	.....	5.948	.....	27.728	.....
July	6.006	.....	5.856	.....	26.800	.....
August	6.027	.....	5.878	.....	26.938	.....
September	6.216	.....	6.056	.....	27.563	.....
October	6.222	.....	6.070	.....	28.075	.....
November	6.375	.....	6.225	.....	27.781	.....
December	6.593	.....	6.443	.....	27.938	.....
Year	6.198	.....	6.048	.....	27.020	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.